BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXXII 1900. No. 5

EXPLORATIONS IN THE CENTRAL PART OF BAJA CALIFORNIA.

BY

GUSTAV EISEN, PH.D.

CONTENTS:

1. INTRODUCTORY.—The following account of some of my late travels in the central part of Baja California is based upon several voyages made during the last three years. My previous journeys to the Cape Region of this peninsula have already been described in the Proceedings of the Cal. Acad. Sci. in 1895 and in the Journal of the AMERICAN GEOGRAPHICAL SOCIETY in 1897. The object of these journeys has been one and the same—the horticultural, botanical and zoological exploration of the district. During my last journey from Loreto to Sierra Pintada special attention was also paid to the mineral resources of the district, and especially to the placer mines then lately discovered, and about which a "boom" had spread even to the United States. During these various voyages I have repeatedly visited at first the Cape Region, extending from Cape San Lucas to La Paz, and later on the country north of La Paz to near

the 29th parallel. My last voyage (June–August, 1894) extended overland from Loreto to Sierra Pintada, a rocky promontory on the Pacific side west of San Ignacio. As the incidents of these trips are less interesting from a geographical point of view and more suitable for a book of travel, I will in the following paper confine myself to such data and details as will illustrate the nature and aspect of the central part of this very interesting and yet little-known peninsula. In this connection I wish it to be distinctly understood that what is said here relates exclusively, except where otherwise stated, to the central part of Baja California. Both in the Cape Region and in the northern part of the peninsula the conditions are somewhat different.

The most easy way to reach the southern and central parts of Baja California is by steamer from San Francisco, one leaving the 7th day of every month. It takes two days to reach Ensenada de Todos Santos, on the Pacific coast, near the United States boundary line, and it takes four additional days to arrive at San José del Cabo. At this place the steamer stops half a day or so, and there is opportunity to visit the town and the many interesting gardens and plantations surrounding it. In two days more we arrive with the same steamer at La Paz, the capital of the southern district of the peninsula. Here we exchange our commodious steamer *Curaçao* for the miniature steamer or tugboat *Rio Yaqui*. This little miserable boat—which, I understand, now lies at the bottom of the Gulf—was never intended to accommodate any passengers. It had only berths for six, but the company had sold tickets for 75 persons, and consequently there was no room even to move. However, after two days we reached Loreto, and landed without any adventure with the sharks. At Loreto we remained long enough to get an outfit, consisting of mules and a guide. The principal merchant in town, Don Juan Antonio Romero, took us kindly in hand, and did us much valuable service. He even extended his courtesy so far as to accompany us to San Xavier. San Xavier, or rather San Francisco Xavier, is one of the most interesting places in Baja California, the beautiful Mission church being the handsomest building on the peninsula and the best-preserved Mission church on the Pacific coast outside of the mainland of Mexico. It is built of cut stone in a noble Romanesque style, and is worthy of special care by the Government. However, this care, so necessary in order to preserve it, does not seem to be forthcoming, and as a consequence the inevitable destruction will soon follow. At the first approach to the narrow cañon in which this church suddenly looms up, one is amazed at the presence of

such a beautiful structure in such an isolated place. Surrounding the Mission there are now, perhaps, only fifty acres in all cultivated and irrigated, while enclosing these rise tremendous perpendicular walls of a narrow gorge, beyond which on every side are other narrow cañons and desert hills without water and without population. The explanation is that formerly this country was inhabited by numerous Indians, whom the missionaries struggled hard to convert and civilize. As there was a small but constant stream of water in this cañon, a Mission was early established there. The beautiful church was built partly and principally with money derived from the pearl fishery, which in early times was much more profitable than now.

It was our intention to follow the trail from San Xavier northwards through the central part of the peninsula as far as San Ignacio, and from there to strike across to the rocky promontory of Santa Clara and Sierra Pintada. But circumstances made it necessary to return to Loreto, and after some new arrangements, to make a new start direct for Comondú. I had at first intended to follow the central route or trail which passes over the mountain chain or sierra, but I soon found that this route was entirely impracticable for any one with limited time. The sierra is only rarely traversed by any other than stock men, and the trails are not such as can be used by pack animals without much loss of time. After the first few days of struggle over rocks and down steep ravines, I decided to follow the least difficult and tedious trail in order to reach Santa Clara within the time previously set. From Loreto there are three different trails running parallel through the peninsula, northwards as well as towards the south. One trail follows the east or Gulf coast, another passes along the backbone of the sierras, and a third one passes more to the westward, here and there skirting the Pacific and now and then turning towards the centre in order to touch some small town or village. This latter trail is by far the most travelled of the three, as it is also the least troublesome to follow. When we speak of trail or road in this part of Baja California we must not misunderstand the meaning. There is no such thing as a road in the central part of the peninsula, and what we designate as trail is often only a more or less distinct path made by the mules and cattle. In very few places has any work been done in order to improve the trails, except in the immediate vicinity of the villages, where it was absolutely necessary to do something in order to prevent loss of life and property. It appears, however, that during the early part of the Spanish occupation some work was done with the aid of Indian labor,

which at that time was to be had, and there are traditions that some remarkable roadwork, the remains of which are yet seen in the vicinity of San Ignacio, was actually made by the Indians before the Conquest.

I will now shortly refer to the places passed through on my last trip. It must be remembered that the name of almost every place mentioned is also the name of the arroyo or river-bed in which it is situated. Many places referred to are mere ranches, some of which are only inhabited during the rainy season, on account of absence of permanent water supply. In the central part of the peninsula—from La Paz northwards—there are only very few places which might be called towns. These are San Luis, Loreto, Comondú, Purísima, Mulejé, Santa Rosalia, and San Ignacio, and even the best of these are only villages. However, in a country where no larger places exist the smaller ones become of importance, and even ranches and arroyos are given a prominence which they would not attain in more settled countries. We must remember that in Baja California the traveller is happy if he can find water enough to satisfy his thirst, and, accordingly, water-holes even become of unusual importance and worthy of being marked down and correctly located on the map.

At this place I will take occasion to say that the peninsula which to us is known as Lower California is known to the Mexicans as Baja California. The southern part of our own California is known to ourselves as Southern California, and it is of importance in speaking of these countries not to confound the names of the two. To the Mexicans, as well as to the early settlers—the Forty-niners—in our California, this, our State, was known as Alta California, which in English means Upper California. In order to make clear what country is meant I have often used this word as a distinction from Baja California.

2. Notes on Places of Interest and Importance between Loreto and San Roque.—Loreto, once the most prominent place in Baja California, is now a mere village of a few hundred inhabitants. The once fine church, with its famous "Virgen de Loreto," is now in ruins. From Loreto the road or trail passes due west, ascending the Sierra and passing the crest at a point called Las Parras, situated at an elevation of about 1,800 feet. Stopping-places are San Telmo, where there is a spring of water, and San Matías—the latter only a camping-place for the night, about 1,800 feet above the sea.

SAN MATÍAS.—Camping-places on the road are Santa Isabel, where lunch is taken; Santa Lucia, a ranch with water; Arroyo Palmadito, so called on account of groves of the large fan palm (*Washingtonia Sonoræ*). Mesa de los Pilares is a high table mountain to the left. Camp at a ranch, El Quiñi, where water is found.

QUIÑÍ.—Starting at sunrise from El Quiñí, we reach Comondú at 9.30 A.M. It is said to be about sixteen leagues between Loreto and Comondú—not in a direct line, but as the road runs. At Comondú there are two settlements in the same arroyo. The village proper situated further down the arroyo is known as San Miguel de Comondú, while the Mission, situated one league higher up to the east, is called San José de Comondú. Comondú is one of the most important places in Baja California.

COMONDÚ.—Leaving Comondú in the early morning, we rest at noon in the Arroyo Pabellón, and stop at night at San Vicente, a ranch where water is found. Between Comondú and San Vicente the distance is about eight leagues.

SAN VICENTE.—Leaving that place in the early morning, we reach the village of Purísima at 9.30 after a two-league ride. From Comondú to Purísima is said to be from nine to ten leagues. Purísima is situated eight leagues from the Pacific Ocean, and from eighteen to twenty leagues from the Gulf. From Purísima to San José de Gracia there are said to be forty leagues. In Purísima we remain several days in order to recuperate the animals.

PURÍSIMA.—Leaving Purísima in the afternoon at 3, we reach camp at the Arroyo Guajademí, where only bad water is found. Guajademí is also the name of a high mountain peak.

GUAJADEMÍ.—Starting at 6 A.M., we camp at noon in the Arroyo El Mezquital. At San Juanico, close to the shore of the Pacific, we find water at 5 P.M. But, as there is no feed for the animals, and as the water is undrinkable on account of the multitude of coyotes which visit the spring nightly, we continue on the road a few miles to a small arroyo, El Mezquitito, where there is feed for the mules, but no water.

MEZQUITITO.—At this place there is nothing but open desert and an arroyo a few feet deep. We start at sunrise and arrive at Cadejé at 9.30 A.M., after having passed the arroyo of Carrizal.

CADEJÉ.—There are half-a-dozen houses and quite a stream of good water and some plantations. Between Carrizal and Cadejé there is a league and a half. From Cadejé to San Raymundo there

are two leagues, and from San Raymundo to San Juan there are two leagues more. At San Raymundo there is water, but we pass on to the Arroyo San Juan, where we camp. Here there is no water. The arroyo of San Raymundo is one of the largest in this part of the country; but there is little water found there, and that is bad.

San Juan.—From this place to Los Dolores, a small arroyito, there is a league and a half. From Los Dolores to Arroyo de las Vacas about a league and a half. From Las Vacas to San José de Gracia there is about one league. As there is an abundance of water at this place, and some very fine orchards and other plantations, we camp here early in the afternoon.

San José de Gracia.—A small village. We start early in the morning and camp at the ranch San Benito at noon. Here is plenty of water for stock and some for irrigation purposes, but the land is limited. We start again in the afternoon and reach in the early evening Patrocinio.

Patrocinio is situated twelve leagues from the Pacific Ocean and about thirty leagues from the Gulf of Cortés. Patrocinio is a small hamlet, with, perhaps, fifty houses of the most poverty-stricken kind. We start early in the morning and rest at noon at Jesus Maria, where there is water, and camp at night at the Arroyo Estiladera, where water is also found.

Estiladera —We leave early in the morning and rest at noon at a ranch, San Joaquín, where running water is found. At night the same day we reach San Ignacio.

San Ignacio.—This is the largest place in the central part of Baja California; but as more will be said about it later, I will content myself here by stating that San Ignacio is the meeting-place for all the trails in this part of the country. Mules and guides can be readily procured here. From San Ignacio a vast plain extends to the Coast Range on the Pacific side. This plain is at present an immense desert, with little or no water, and difficult to cross. Until the year of my visit this plain was seldom traversed, but on account of the discovery of gold in the Sierra Pintada a stream of gold-seekers had now found their way across this barren and inhospitable country, and a regular trail had been trodden in the sand —so plain, indeed, that there seemed little or no danger of getting lost. Still, several parties had gone astray, and some had lost their lives in the sandy waste. We leave San Ignacio after having procured a new outfit of mules and a guide, and start down the arroyo

at 3 P.M. Camp on the plains between the arroyos San Juan and San Angel. At San Angel is the last water to be found, and we must traverse the plain without further supply, the next watering-place being the Tinaja de Santa Clara.

SAN ANGEL.—We start early, and after a few hours' ride arrive at the arroyo of San Angel. Several springs in the arroyo, and the water is fair in at least one of them. From there the road leads across the desert due west and we begin to ascend the Santa Clara mountains in the evening. Camp in the foot-hills, or rather on the slope of the mountain, near a peak called the Tecolote (the Owl), on account of its resemblance to an owl's head.

EL TECOLOTE.—As there is no water at this place, and as we have had no water since six yesterday morning, we start early only to find that the mules have run away. It takes several hours to find them, and a long delay is caused. We arrive at 9 A.M. at the Tinaja de Santa Clara, a deep water-hole in a gulch. This water is the best in the whole of this region; but thousands of human beings and mules have drunk the pond almost dry, and the water has been much contaminated. We rest here only long enough to recuperate, and reach in the evening the arroyo of San Lorenzo, where there is another water-hole. But as this water is said to cause the death of animals, and as poisonous plants are said to abound near the arroyo, we consider it best not to tarry here but to start up the coast. At 10 P.M. we reach a place suitable for camping at the foot of Cerro Prieto. Here is no water and scarcely any feed. Having ridden since sunrise, or about eighteen hours, we are completely worn out. This is a desolate place and the most inhospitable camp.

CERRO PRIETO.—The camp is named after a dark hill standing out prominently from the other more distant mountains. We leave as early as is possible, the mules, as usual, having run away in search of food. We ride all day and pass two small arroyos, Saladito and San Rafael. In both there is some salty water in shallow, dug wells. We stop at noon at San Rafael and camp at night at La Huerta, a most beautiful little arroyo, where, however, there is no water—no well dug. But there is an abundance of finest feed and many flowers. Thousands of cotton-tail rabbits. Everything indicates that water is very near the surface. Between Cerro Prieto and La Huerta rain has lately fallen, and there are many flowers.

LA HUERTA.—The name is given by our party, no name existing previously. We start rather early, long before sunrise at 3 A.M.,

and arrive at San Andrés in time for breakfast. The bed of La Huerta is covered with large clumps of mezquite trees.

San Andrés.—This place is merely a camp for the miners. There is one house and a dozen tents. There are also about a dozen dug wells at the base of a hill. From these wells water is carried on donkeys to the placer mines, some sixteen to twenty-five miles due east, up in the mountains. From San Andrés there are only a few miles down to the landing-places of San Roque and Asunción, the latter being the safer. Both are open roadsteads and only poorly protected by promontories.

3. Rainfall and Climatic Conditions.—The climatic conditions of Baja California are but little known. The peninsula receives its rainfall from two distinct sources and at two different times. In a former paper I have stated that the rainfall of the Cape Region from La Paz to San Lucas differed from that of the other part of the peninsula. This statement is not quite correct, as several visits to the central part of this country have satisfied me that the change from the tropical region to the one next north of it is not as sudden as at first I believed. The general rule is that Baja California enjoys summer rains on its Gulf coast, while on the Pacific coast it receives principally the scanty winter rains. The summer rains are the tropical rains which originate in the Gulf of Mexico, and are carried over the Mexican mainland and precipitated on the higher eastern coast of Baja California. These rains are strongest in the Cape Region, or rather on the mountainous part of the Cape Region in the vicinity of San José del Cabo, and diminish from there towards the north. At La Paz rain does not fall every year. But north of La Paz the rainfall on the Gulf coast begins to increase, this being due to the high and narrow sierra which follows closely the line of the coast, and extends almost uninterruptedly as far as Alta California. It follows that the whole country enjoys to a larger or smaller degree the benefits of these tropical summer rains, which, however, are neither general nor certain. While the high sierra always receives thunder-showers in sufficient quantity to procure a crop of grass for the stock, the lower regions receive much less rain, and that at a slightly later time. Thus the eastern coast has rain every year in small quantities as early as July, while the western coast may get its rain a month or so later, if at all. The western coast may not have any rain for three or four years at a time, while on the eastern coast the rain may be considered regular, though scant. On the eastern side the summer rains extend,

as stated, as high up as to California, while on the western slope San Quintín may be said to be the highest point north to which the tropical summer rains ever reach. This is the more worthy of notice as the peninsula is so very narrow. The reason is, however, evident. The tropical rains coming from the south precipitate on the cooler eastern sierra; but as the country is gradually sloping towards the west, it follows that this part is less frequently cool enough to precipitate the rainfall. This tropical rainfall can be traced as far up as the centre of Alta California. Here it manifests itself by occasional thunderstorms in the Sierra Nevada, generally in the month of August. It is the same tropical rain-belt that furnishes Sonora and Arizona with their summer rains, which occasionally extend even over the Yuma and Colorado deserts.

As regards the quantity of rainfall nothing is certain, as no measurements have ever been made. I estimated the rainfall in the sierra of the Cape Region at some thirty inches. It is safe to say that this rain diminishes as we proceed northwards. It is dependent upon the height of the sierra. The high peaks receive more than the lower ones and the mountains more than the lowlands. At the high San Pedro Mártir, which probably is over 10,000 feet high, the rainfall is probably equal to that in the sierra of the Cape Region.

The other source of rainfall is the northern rains from Alaska. The west coast of Baja California gets the tail-end of these rains—not regularly, but in a most sporadic manner, and as far down as to the Cape San Lucas. These rains, which generally come late in the winter, in January or February, can never be depended on. They may come every year for several years in succession, or, on the other hand, they may be absent for from two to ten years.

As has been stated, the summer rains commence generally in July and last until October. They are most capricious as regards time and locality, and while one place may be deluged another close by may never receive a drop. This is frequently seen in passing through the country. In some places I found flowers and grass in abundance, and the animal life was represented by thousands of snails crawling on the bushes. A few yards or a mile away everything was barren, dry and dead, no rain having fallen there for years. When the water comes down it generally comes in torrents, washing everything before it. This torrential rain, which may amount in a single shower to three or four inches, has thus rarely the opportunity to sink deep in the soil. On the contrary, it carries everything before it, and leaves its trace behind in the formation

of the precipitous walls of the cañons and in great washouts. The amount of rain that may fall in a single season has never been ascertained. It is probably much greater than would appear from the vegetation on the ground, most of it running to waste before entering the soil. From experience in Alta California I doubt if the annual rainfall anywhere on the east or Gulf coast will reach ten inches, except, perhaps, in the highest peaks, where torrential rains are more frequent. On the western, or Pacific coast, the rainfall probably seldom reaches even six inches. But as this scanty rain falls at a time when there is little or no frost, it enables the vegetation to start at once, and every drop almost which sinks into the soil is utilised by the immediately sprouting plants.

To recapitulate and summarize, we find that the peninsula of Baja California is only scantily supplied with rain. The summer rains extend from Todos Santos and Cabo San Lucas, in the south, as far up as to the Sierra Nevada, in the northern part of Alta California. These summer rains are most frequent and heavy in the Sierra backbone, which runs along the east coast of Baja California; but it extends also down to the east shore-line as well as to the western coast. Thus the central strip, half way between the two shores, receives more or less rain yearly, but as we approach the Pacific shore the rain becomes more uncertain and sporadic during the summer time; this being due to the absence of high mountains on this side. But this want of summer rains is to a very slight extent compensated by the presence of winter rains, which now and then extend from Alta California down to the Pacific coast, even as far south as San José del Cabo. These winter rains never enter the Gulf, and they diminish in quantity and regularity as we go south. Down as far as San Quintín they may be considered fairly regular, but below this point they become very uncertain. The reason why San Quintín appears to be somewhat of a terminus for both the southern and the northern rains is probably due to the vicinity of the highest mountain or sierra in Baja California. The height of the San Pedro Mártir sierra is such that it precipitates with facility both the rains coming from the north during the winter and from the south during the summer time.

4. Water-Courses and Springs.—The torrential rainfalls give to the whole of Baja California its characteristic appearance. The country consists of one mass of parallel arroyos or dry water-courses, the majority of which carry water only during and immediately after the rains. During the rainy spells the water in the

arroyos carries everything before it, but as soon as the rain is over the water disappears. Only in a few arroyos is there any kind of permanency as regards the water supply, this being mainly due to the nature of the rock or strata underlying the river beds. Thus, in the arroyo of La Purísima we find a succession of water-holes, some probably one hundred feet deep. Between these water-holes the water flows the year round in a tiny streamlet—enough, however, to secure a fair supply for irrigation, while in the deep water-holes we find fish and water terrapins of large size. Nowhere else are there as many water-holes as in La Purísima, and looking down on the arroyo from the top of the mesas, it appears as if there was actually a broad and continuous stream coursing down the cañon. But this is a deception, and upon closer inspection we find that there is a mere succession of water-holes, with the tiniest stream of water passing from one to the other. This, of course, refers only to the end of the dry season, as during the early part of this season, and after the rains, a large quantity of water runs down the river-bed. Of all the arroyos in this part of Baja California that of Purísima carries the largest amount of running water. In some other arroyos we find fair supplies of water for irrigation, but the water is of a different nature, as concerns its origin.

We now come to a feature highly characteristic of Baja California—springs and water-holes. We will first consider the former. Springs, in the sense understood in the United States, are rare in Baja California, and I know of comparatively few places where water gushes out of the hillside, forming a regular spring, such as we find everywhere in rainy climates. In the mountains of Baja California such springs are naturally less rare, but on the lower lands we may hunt for them in vain. Wherever springs are met with, in ninety cases out of a hundred they are situated in the river-beds or in the beds of otherwise dry arroyos. They either gush out from the bottom or from the sides of the cañon walls, and we are almost sure to meet with a farm or a village close at hand. The majority of these springs are small and do not suffice for extensive irrigation, but in a few instances they are enormously large and sufficient to irrigate thousands of acres. I have in a former paper on the Cape Region called attention to the large spring at San Bartolo which pours out from under a stratum in the bank of the cañon and actually forms a small creek of its own, irrigating the whole cañon for several miles. A similar condition exists at Comondú and at San Ignacio. At Comondú we find two large springs rushing out from under rocks in the dry river bottom and supplying a settlement of several

thousand acres. The two springs are situated perhaps one hundred feet apart, one on each side of the narrow cañon, and each must carry some ten feet of water per second. The supply has always remained the same as far as the memory of man goes. Above these springs the cañon is dry and barren, while below them we find a most luxuriant and tropical vegetation of date palms, bananas, figs, sugar-cane, etc.

The most famous of all these springs is, however, the large spring or springs of San Ignacio. These springs originate also in the bottom of the cañon, and so great is the water supply that a regular creek is formed, which not only irrigates the country for miles below but in places forms regular swamps. From these springs some fifty thousand date palms are irrigated, besides fields of maize, beans, etc. Smaller springs of a similar nature are found in many arroyos, as, for instance, at San José de Gracia, San Benito, and hundreds of other places. Water-holes constitute a feature peculiarly characteristic of Baja California. These water-holes are found only in the bottom of some arroyo, generally in the trap rock. If it were not for these water-holes all travel in Baja California would be impossible during the dry season. In order to find the holes it is necessary to have the assistance of a guide, as there are no superficial features which would indicate them from a distance. We come upon them suddenly and lose sight of them as suddenly again, hidden as they are between perpendicular rocks and often without any surrounding vegetation large enough to be seen at any considerable distance. In many of these holes small fish as well as water terrapins—the latter known as *ahuamas*—are found, indicating that the water supply must be constant. Such water-holes are known to the natives as *tinajas*. They are found in the most unexpected places, the large Tinaja de Santa Clara, for instance, being situated high up in the Santa Clara mountains, among rocks of extreme barrenness.

5. Aspect of the Country.—The central part of Baja California may be described as a vast elevated plain covered by a thick layer of trap rock. Above this plain there rises all along the east coast a high crest, a sierra of granite, the peaks attaining a height of from 2,000 to 3,000, and in isolated instances even as high as 10,000 feet. From this main sierra the country slopes gradually to the Pacific and much more speedily to the Gulf coast. West of the sierra backbone the sloping plains are cut through by innumerable arroyos or river-beds, while above the general level of the plain

rise thousands of isolated table mountains known as *mesas* and *picachos*. The *mesas* are the flat lava-covered mountains, while by *picachos* are understood those mountains which have had their tops worn down and have assumed a more pointed appearance. The nature of the high granite peaks of the sierra is that of sharply-pointed barren pinnacles, most beautiful on account of their wild and irregular form, the absence of trees causing them to stand out more sharply. The lava, or rather the trap rock, is the most prominent feature of this part of Baja California. It seems that in a not very remote geological period this whole country has been flooded from one end to the other by numerous eruptions of basalt or trap, which, when cooling, assumed the well-known forms of innumerable narrow parallel columns. Nearly all the cañon walls and walls of the river-beds consist of such perpendicular columns, and when travelling through any one of the many cañons we may without much difficulty imagine that the walls on either side have actually been built up by artificial means. But it is not only in the walls of the cañons that we meet with these rocks. The whole country is overlaid with them to such an extent that we may travel for days over hundreds of miles without finding any other surface than basalt. In places the columnar nature of this rock has caused the surface to be broken up into continuous piles of basaltic stones, situated so close together that it is impossible to step anywhere except on a rock. Such is the nature of hundreds of miles of territory, the whole surface of which looks as if it had been most skilfully paved with rocks from the size of an egg to that of a small barrel. Between these rocks there may or there may not be a few inches of ashy soil deep enough to sustain a few grasses or bushes or a few agaves or cacti. As to the possibility of farming this land it is simply out of the question, except in the arroyos or on the deep and softer soils in the immediate vicinity of the coast. But the great plains of the interior of this part of Baja California must forever remain the barren waste they are to-day, only suitable for occasional grazing by cattle. This lava or basalt blanket, which covers everything, varies greatly in thickness. In places it seems only a few feet thick, while in other places we can see how the water-courses have cut their way through hundreds of feet. Here and there on the plains we meet with smaller or larger piles of trap rock, appearing as if they had been piled up there carelessly in order to be ready to supply some intended gigantic building. These are evidently places of eruption, from which the basalt has spread in all directions, like a puddle of cement, over its gravelly bed. Within

a few miles of the coast this basalt blanket generally gives out, having been washed away or undermined by the torrential floods and rains. In such places the land is slightly rolling, exposing the white or yellowish, ashy and volcanic soil underlying the great basalt covering. Such is the aspect of the country from La Paz to San Ignacio and San Roque in the north. As all the settled places, without any exception, are situated in the bottom of some cañon or arroyo, they do not in any way disturb this general aspect of the country. The settlements are never seen from any distance, but we stumble upon them suddenly and unexpectedly, their vegetation even never projecting above the general level of the plain.

The sierra backbone is a most interesting one. The view of the high and picturesque peaks may be enjoyed already from the Gulf. They assume the most fantastic forms, often of great beauty, especially when colored by the glorious and marvellous sunsets of this region. In the high sierra we meet with an increase of vegetation, and pines and palms are there common in the most favored localities. Seen from a distance, however, the peaks look barren and bare, and do not present any outlines rounded by forests. Such forests are found only in the sierras of the Cape Region and on the top of the high San Pedro Mártir.

Volcanoes are not unknown in this country, though none is now active. The largest volcano is the one known as Las Virgenes, situated northwest of Santa Rosalia. It may be seen from the Gulf, and presents a fine and magnificent view. As I have not ascended any of the high mountains in this region, I can only refer to them in a general way.

As regards vegetation, little can or need be said. To the botanist there is an endless variety of interesting and remarkable plants met with everywhere, but to the average traveller there is little to charm the lover of forests and trees. The great basalt blanket is barren, and presents no trees. Here and there we find thickets of shrubs and cacti, small in height and dry in appearance. In favorable places, where the basalt has become more disintegrated, these shrubs grow higher and denser, and we find even thickets of the agave used by the natives for the distillation of mezcal. It is especially the slopes of the walls of the cañons which offer the best-growing places for the agave, but occasionally we also find it on the mesas, where the soil is deeper and where the basalt blanket has been broken up.

In the river-beds we sometimes meet with a dense and most picturesque vegetation. Here are enormous, tall cacti, like columns

cut out by artificial means, and with dense thickets of the beautiful mezquite in numerous varieties. Here we also find groves of the stately fan palms (*Washingtonia Sonoræ*). But all this is only in places where the water is near the surface or where the rainfall is more constant. At the time of my visit many of these once so beautiful cañons were drying up and the trees were dying from lack of moisture. Trees which must have been several hundred years old were perishing because, as I was told, no water had fallen for four or five years and no floods to irrigate the bottom lands had come down for that length of time. Along the west coast there is even less vegetation in the cañons, and we travelled for hours and days without seeing anything but bare soil and here and there a few dwarf bushes. The soil is mostly glistening white, and the whole country looks as if modelled in clay. But let only a few copious rainstorms come and the barren ground will cover itself with a beautiful mat of flowers and green, and the branches of the shrubs will at once shoot out leaves. The whole country will then change in a few days from a barren waste to a paradise.

The promontory of the Santa Clara and Sierra Pintada requires a few words separately. Here the mountains are less basaltic and more volcanic, and accordingly the soil is deeper. The effect of this is that even in regions where the rain is very scant and irregular the vegetation is better. We find there miles and miles covered with a low and vigorous shrub, the *Torote*, which in places actually spreads over the ground as a kind of low forest. These torotes are most wonderful to look at. The trunk is enormous for the size of the tree. It branches itself close to the soil, and the many branches follow and rest on the ground for ten or more feet from the stem, the whole tree forming a large semi-globular bush of ten or more feet in height. If to this we add that each branch is almost as thick as the tree itself, and that it curves and bends itself like an immense snake, we can form an idea of the main vegetation on the slopes of this coast. These torotes stand at considerable distance one from the other, and, as they are low, they do not in the least hide the general outlines of the ground. Though small, these trees give considerable shadow—the only one that can be derived from the vegetation in these parts. At the time of my visit a rain had fallen—the first for several years—and while many torotes had already assumed their leaves, others were just in bloom. And lovely blooms they were, in clusters of beautiful lilac, with a sweet, delicate aroma, the whole bush appearing as a single clump of delicate violet lace. Along the seashore there is for several

miles inland a low vegetation of dry and grey-colored bushes, seldom over two or three feet high. Most of these are so strongly aromatic that the mules refuse to eat them, even when they are dying from want of food. Only during the rainy season is it possible to find grasses and annuals in bloom. But very little rain is actually required to rejuvenate this arid country. As we look about us to the right or left, we find but barren plains, scantily covered here and there with low, dry-looking bushes. The *mesas*, or table mountains, which may be seen lining the horizon in this part of the peninsula, stand out boldly and sharply against the sky. On the side towards the ocean these mesas are steep and well defined, while towards the east or the sierra they are made out gradually in the general slope of the country. More towards the east the peaks of the sierras are seen, ragged and sharp—here like needles, there again as pyramids. None of these mountains are covered with sufficient vegetation to soften their outlines, the shrubs which are found being hardly large enough to be noticed until we are close upon them. In a general way the vegetation of this part of the peninsula resembles the barren parts of the Mexican mainland, and especially Sonora and Sinaloa. A large part of the genera are similar, but many, of course, are different, and peculiar to Baja California.

Of the animals met with in these parts there is here only room for a few remarks. We found on our trip to the country hares, rabbits, and deer almost every day. Ground squirrels and chipmunks are not uncommon, but not as numerous as in Alta California, this probably being due to the difficulty of burrowing through the basalt surface. But even the barrenest parts have their birds, and we could wake up every morning hearing the birds singing, even if there were nothing but tall cacti to be seen. In the tallest of these columnar and spiny vegetable monsters various species of wrens and other birds make their nests, partly protected from the attacks of snakes. Snakes and lizards are found everywhere if we look for them; but they are much less numerous than in the Cape Region, in which place they occur in countless numbers. If we turn over stones and fallen cacti we are nearly always rewarded by finding scorpions, spiders and centipedes of numerous kinds. If we search the rocks and sheltered places in the cañons we uncover heaps of shells of various kinds of land molluscs. Or, if we wait until the first rain falls, we may collect the same varieties of shells alive, crawling about over the rocks, only to disappear again when the shower is over. The size and variety of these Baja California land

shells are simply wonderful. In color they are white, in size they range from half an inch to three inches or more. Every cañon, almost, has its peculiar variety, and every isolated mountain rewards the collector with new and interesting species. The great resemblance between the land shells of the barren plains of Baja California and Chile has often been pointed out, but so far no exhaustive comparative researches have been made. If such a connection between the two barren countries of the Pacific Slope could be established, it might point either to an ancient continuous barren climate extending from one country to the other, or it might indicate a succession of islands existing formerly some distance out from the shore of the Pacific. Such islands, if sufficiently far from the mainland, would necessarily be barren and dry and in no way partake of the tropical and exuberant nature of the Mexican and Central American mainland. Such islands would readily form the connecting links over which a fauna and flora could pass, even by the Equator, from one distant country to the other.

The great number of land shells found in these barren regions is simply marvellous. In some localities it would not be difficult to collect cartloads of them. We need only lift the stones to find them dead by the thousand. The live shells escape farther in, where it is difficult to follow them. But it is not alone the shells which are so plentiful in this dry country. As soon as the rain has set in and the country has got a general soaking, the whole nature changes as with the waving of a magic wand. The trees cover themselves with foliage, countless beetles, butterflies and other insects appear all at once and swarm everywhere. Every flower and every bush is a zoological garden, every pool an aquarium, every sheltered and damp nook is alive with snails dragging their turreted or rounded shells on their backs. But a few weeks of dry weather change all this. The insects die, the plants dry up, the snails seek their summer or winter homes, far in among the rocks. The bushes shed their leaves, the dust gathers, the rocks become heated, and the whole country assumes an aspect as if it had just been created out of white, dry clay. The biology of the mountains is slightly different. There we meet with taller trees, and even with forests. Springs are running all the year round, and a green vegetation is always found in sheltered and favored nooks. The eastern coast is much more densely covered with bushes or low trees, and as we ascend, even a few hundred feet, above the sea-level, the barrenness of the country is considerably modified. Yet we must not forget that in all this barrenness there are oases hidden among

cañons so completely that they are not perceived until we are at their very border. But these places are generally cultivated ones. No water could be allowed to go to waste on wild shrubs and trees; every drop is, in a crude way, appropriated for irrigation and for the creation of palm groves and maize fields.

In Alta California the rain occurs during the most unfavorable season of the year; in Baja California it occurs during the most favorable season; and this difference in season is fully sufficient to explain the enormous vigor of animal and vegetable life which is so characteristic and manifest during the short periods of rain in the peninsula of Baja California.

6. Settlements and Agriculture.—It is not my intention, nor is it feasible in this paper, to refer in an exhaustive manner to the possibilities of agriculture in Baja California; but as some readers will naturally ask, what, after all, this country is good for, a few remarks upon what actually exists may prove of interest.

Artificial irrigation exists only in comparatively few localities, and no great expense has anywhere been resorted to in order to supply water for irrigation purposes. The water is taken as it comes and wherever found. When it is running it is used up; when it is not running the plants are allowed to suffer. There are no large dams and no tunnels, and no great effort is made to keep the water back and to husband it in order that it may irrigate a few more acres. In only a few places, like Comondú and in San Ignacio, is the water supply said to hold out. In general it has been diminishing during the last fifty years. Thus at San Xavier we can see hundreds of acres which years ago were irrigated, but for which water cannot now be had. This may be due to diminished rainfall, as is the opinion of the people, or it may simply be the result of the destruction of the irrigation ditches made by the Padres. Remnants of such cemented ditches are seen in several places, but no apparent attempt is made to repair them. This lethargy is partly due to the fact that these irrigation works were constructed and maintained by Indian labor, free of cost. The Indians are now all dead; and as thus slave labor does not any more exist, the works of the *antiguos* are not repaired. Another reason is that the people are grossly ignorant and lack enterprise. This is the more important as population is not wanting. Nearly every family raises ten or more children, but as soon as the boys grow up they emigrate in order to seek for better surroundings in other countries. Then, again, the nature of the country is such that, even

if an increase in production could be accomplished, it would be difficult to dispose of this product. There are no means of communication, and most of the produce must be consumed at home. There is no doubt but that with a comparatively small expenditure of money for the development and storage of water the productiveness of the country could be enormously increased. This increase will, however, not be likely to be brought about until some new impulse is given to the mining industries, which alone can employ a large number of men and families, who necessarily must become large consumers of food products. As far as I can see, there are few industries which can accomplish this but coal and coal oil. I am satisfied that in the near future both these products will be exploited in or near Baja California, as they are known to exist there in several localities.

Here a word or two may be said about the natural products, such as may be had without special cultivation. Foremost among these is the orchilla, a lichen growing on the stems and branches of low bushes along the coast. This orchilla looks like the gray moss found on trees in every country; it is a few inches long and resembles a gray beard. There are several kinds growing on the bushes, but only one species is valuable and worth gathering; and at the time of harvest we find camps of Mexicans here and there along the coast. When one place is exhausted the camp moves to another locality. In five years or so the orchilla has grown again enough to be ready for another harvest. The only danger that the orchilla will be finally exhausted is in the unscientific way of gathering. Along with the valuable variety grow one or two which are worthless for the production of dye. These varieties are allowed to remain untouched, and as a consequence they will multiply more rapidly, and finally will drive out the valuable kind.

Another source of income may be found in the agave, which grows in many localities. Its base is now used for the production of mezcal, but the fibres of the leaves are said to be strong, and may be used for the manufacture of ropes, etc. No effort has been made to utilise it for such a purpose. Another source of revenue may be derived from the inexhaustible banks of clams found on the coast. These clams were the chief food supply for the ancient Indians, who have thrown up the shells into veritable mounds, twenty or more feet high and miles and miles in length.

The trap blanket which covers the country explains the distances of the cultivated places from each other. These latter are generally several days' travel apart. They are, of course, only connected by

trails, as there are no roads outside of the mining districts of the peninsula. But these trails are only trails in name, not in reality, as no work has been done on any of them except in the immediate vicinity of the villages. In many places the trails are so stony that the mules have to step over the boulders, and for miles and miles the progress is like that of a snail. We will now consider a few of the principal cultivated places in this part of the peninsula.

LORETO, once the most important town in Baja California, is now a mere hamlet of a few dozen houses. The ruins of the famous Mission are yet standing, and part of the church is used for service. The decay of the place dates back some thirty odd years, when the town was partly destroyed by an earthquake, followed some years later by a flood, which destroyed most of the houses and many of the plantations, even changing the course of the river. There are now only a few hundred inhabitants in all. There are several hundred date palms, and perhaps two hundred acres in cultivation in various crops. The date grows without irrigation on account of the nearness of the water to the surface. As far as I can learn, there is no export of any consequence—at the utmost a few small boatloads of dates, mezcal, hides, dried beef, etc.

SAN XAVIER.—The Mission church is the handsomest in Baja California, and is not equalled by any in Alta California. The style is Roman, and of great elegance and beauty, and the construction is of stone. The church is well preserved, and could, with little repair, last many hundreds of years more. It is the best-constructed Mission on the whole Pacific coast. Of the Mission part, however, little remains. These accessory parts, which were made of adobe, have long ago fallen. Of the irrigation works of the Padres little remains. There are several *pilas* or water tanks left, but the cemented ditches have fallen to decay, and water is now conducted in open earth-ditches. Consequently, many acres which were formerly irrigated are now dry. The people lay the cause to diminished rainfall. It is probable that they are partly correct; but certain it is that with some little work in saving the water and repairing the ditches much more land could be cultivated and irrigated. There are not over twenty-five persons now at the Mission, the guardian and his family constituting the largest part of the population. Perhaps fifty acres are under cultivation. We admire many large olive trees, which must date back to the first settlement by the Padres. There are also fine old Mission fig trees of enormous size. The olives belong to at least three distinct varieties. Oranges,

cane, maize, beans, bananas and other tropical fruits do well. San Xavier is a lovely spot, an oasis in the desert; but shut up as it is in a narrow cañon, perhaps a thousand feet wide, it is subject to great heat, and can only be agreeable as a dwelling-place during the cooler part of the year.

In the vicinity are a number of primitive distilleries for aguardiente, which is exported to other parts of Mexico.

COMONDÚ.—This place is one of the best known in Baja California. There are two settlements in the arroyo, about three miles apart. The lower place, where the town proper is situated, is known as San Miguel de Comondú; the upper part, where is the Mission, is called after the church San José de Comondú. The Mission is now mostly in ruins, and of the church there remains only the shell. The inhabitants told me that the Government some years ago ordered the church sold as bricks to any one wishing to buy. As a consequence, little now remains of this once beautiful though small church. A single room in the Mission is yet used for service. The whole valley of Comondú is irrigated from two large springs. Some thousand acres are under cultivation, and the orchards and fields extend some seven miles down the cañon. This arroyo opens out in the lagoon of San Jorge, known as the *estero.* The place known as San Jorge is not situated in an arroyo. Comondú is eight leagues from the Pacific and eighteen leagues from the Gulf. The arroyo in which Comondú is situated does not come from the sierra, but rises in the plains. The irrigated part is a forest of palms, fig trees, oranges, lemons, olives, vineyards, etc. I was told that the following figures of the production of this beautiful place are fairly correct: dried black figs, about ten thousand arrobas; raisins (*pasas*), about two thousand arrobas: dates, about two thousand arrobas. There are about 1,600 date trees. Some three thousand arrobas of panoche, or raw sugar, are produced. The figs, as well as the raisins and dates, fetch, as a rule, 50 cents the arroba. They are packed in rawhide bags and transported on muleback to Mulejé. During our stay we found great hospitality in the home of Don Francisco Rodrigues and Doña Josefa Romero, to whom I am indebted for the above information. There are about four hundred inhabitants in the two places.

PURÍSIMA.—From Purísima to the Pacific Ocean there are about eight leagues; to the Gulf, eighteen to twenty leagues; to San José de Gracia, about forty leagues. From Purísima one trail runs to Mulejé over the mountains and to the Gulf, while another trail runs

along the western coast to the Estero El Ranchito, or, as it is known on the American maps, the San Ignacio Lagoon. The arroyo of Purísima is one of the largest in Baja California, and one of the best watered. The water is permanent at the point of the settlements, and with care many times the present extent of land could be irrigated. Now there is irrigated a strip of land thirteen leagues long and from a quarter of a mile to more in width. Our host, Don Trinidad Mayoral, and his son, Don José Mayoral, gave me the following information as regards products. Panoche, or raw sugar, is only produced for home use. There are exported about 7,000 arrobas of raisins and 8,000 arrobas of dried figs. These are of the black kind, known in California as the Mission, and are of superior quality, but they are poorly handled. They are much sweeter than any produced in California. It is interesting to note that it is principally the first crop, or the *brebas*, which is dried. When the water is low (in years with little rainfall) the stretch of land irrigated is reduced to five leagues. There are few dates grown in Purísima. This is due, in my opinion, to the shallowness of the soil, which seems to be underlaid by hard-pan. It is this very hard-pan which causes the water to remain so long in the river-bed, and forms the bottom of the water-holes.

There are, perhaps, two hundred and fifty inhabitants in the settlement of Purísima.

Purísima is famous for its many water-holes. In the rainy season, and when the rain is falling, sufficient water comes down in the river to form a continuous stream all the way to the ocean. But as the rain stops and as the season advances the water becomes less and less, and would soon go down to almost nothing but for the many water-holes, which stretch along for many leagues. They are of all sizes and depths, but generally they are quite large. Many are several hundred feet across, and are said to be a hundred feet or more deep. The natives believe them to be bottomless. At my visit at the end of the dry season the holes were all connected by a small stream of running water, and seen from a distance it appeared as if we had before us an immense river—immense for this country at least.

In the deep and cool water-holes we find fishes and terrapins, or, as the latter are called there, "ahuamas." The species is of much larger size than any found elsewhere in Baja California outside of the ocean.

The Mission church is the poorest and smallest I have seen in the peninsula. It is in fair preservation, but offers nothing of any

interest as regards its architecture—a mere small rectangular building, without towers or ornamentation.

San Ignacio.—This is by far the largest place in the central part of the peninsula. There is a fine old Mission and church, but not as well built as the one at San Xavier. The arroyo is irrigated from a few large springs, and so abundant is the water that it runs for miles down the cañon and forms ponds here and there. There are about 60,000 date palms divided among the many settlers. The number of inhabitants must be at least one thousand. Hardly anything but dates is grown. Nearly all the dates are exported by mules and burros to Santa Rosalia. Most of the crop is distilled into aguardiente, and what is not distilled is sold on the mainland of Mexico.

A word needs to be said about the quality of the products. The soil all over Baja California consists of an ashy loam of volcanic nature, evidently deposited from volcanoes in a shallow ocean and gradually elevated. It is of great richness in mineral matters, but, except in a few localities, poor in humus. The quality of the fruit and cereals, etc., grown in this soil is very fine, though no good varieties have been introduced. The grapes, dried into raisins, are of the "Mission" variety—a bluish-black grape—very sweet, but otherwise unsuitable to raisins. The seeds are small and the skin is thin, but as the grapes are small the raisins can in no way compete with the Muscats grown in California. The dates are perfectly at home, and wherever a seed is dropped in a moist place it soon grows and fruits, but the quality of the variety is poor. It seems to me that the date grown everywhere in Baja California belongs to some ancient, wild stock. It certainly is different from any of the better Arabian or Persian dates imported to California. The meat is coarse and stringy, and the seed is simply enormous, just like that of the Canary Island species. This date is not particularly sweet, and it cannot compare with better varieties from Africa. There are two or three kinds, all with enormous seeds. One variety is very dark, while one is light yellow. A kind growing at the Mission of Los Dolores is said to be a free-stone to such an extent that the dates can all be pulled from the cluster, while the seeds remain attached to the stems. But these coarse dates seem to me to be extremely valuable for cooking purposes. The time to use them for this purpose is when they are nearly ripe but yet hard. If boiled with meat, they are then very palatable, imparting a fine flavor to the dish. I think that an industry of canning dates would be profitable.

The figs grown in Baja California are superior to those grown in any part of the United States or in Sonora. They are larger and sweeter, and also better flavored. But so far only the black Mission and a worthless fig with white skin and large seeds are grown, and no effort has been made to introduce finer varieties, and no one seems even to know that there is anything better to be had. Under such circumstances the prospect of improving horticulture in Baja California is not promising. What is said here about fruit holds good also as regards grasses and vegetables. In every settlement there are waste lands soaked with water through seepage. Instead of planting useful grasses in such places we find nothing but weeds and the bitter *Yerba mansa*, which is useless for pasture. With stock-raising it is very much the same. During a succession of rainy years the cattle thrive well, only to die in years of little rain. This, of course, may not be the fault of the people; but I think that some grasses might be introduced which would require less rain. The Australian salt bushes, and hundreds of other plants, might prove a boon to the country.

As regards the people, it can be said that they are very friendly and hospitable, and if treated right can be depended upon. There is not the least danger to any one, and even the most inexperienced traveller need have no fear, as robberies and murders are unheard of. The inhabitants of Baja California compare very favorably with those of any other country, and their backwardness must in a great degree be ascribed to the extreme isolation of the peninsula and to the relatively small part of the land capable of cultivation.

7. The Placer Mines of Sierra Pintada.—As one object of my journey was to study and report on the placer mines known at that time as the Santa Clara diggings, a few words about the country where they are situated may prove of interest. The promontory, or peninsula, in which these mines are situated is separated from the mountainous region around San Ignacio by a vast plain, which in a recent geological period must have been submerged. At that time the Santa Clara and Sierra Pintada Mountains formed a succession of islands, of which Cerros and San Benito Islands are the continuation and the remnants. The Santa Clara range was separated from the Sierra Pintada, and both were separated from the islands further west. There is now no forest on any of these mountains, and water is extremely scarce. Since the discovery of gold several springs, not formerly known, have been found, and it is probable that several more exist. The mountain peaks are about

3,000 feet high and much broken. In the Santa Clara region the peaks are pointed, while in the Sierra Pintada they have the shape of table mountains, with here and there a few sharper *picachos*, or peaks. The gold in the placers is found in a stratified deposit of coarse white, ashy soil. The mountains themselves are built up of volcanic ashes, stratified and overlaid by lava and, to some limited extent, by basalt or trap. On account of the absence of running water, all the gold is recovered by the dry-wash, that is, it is separated by screens, the dusty soil being fanned away, the heavier gold remaining. At my visit the main settlement was at a place called San Andrés, a few miles from the landing-places of San Roque and Asunción. Here wells have been dug to the number of a dozen or more, at the foot of a mesa, and the water was hoisted out and sold at one real (12½ cents) a burro-load. About 1,000 gallons were thus taken out in a day. The water was carried in 20-gallon kegs on burros to the placer mines situated some sixteen to twenty-five miles away in the mountains, where it fetches 1 real the gallon. The gold region is between lat. 28° and 27°, and mostly on the west side of the Sierra Pintada.

At San Andrés we found some two dozen tents, and one house made of lumber. At the mines there were nothing but tents. Some one thousand men had been at the mines at one time, but at my visit there was not half that number. Everything is carried to the place by small schooners or by mules from San Ignacio. But on account of want of water and food, most of the mules die or are made useless in a few weeks, and so far no one had made any profit in hauling goods. Everything is dear, and I had to spend twenty-five dollars in feed and water a day for my four mules. A sack of flour was worth eight dollars, and so on. The price paid for the virgin placer-gold was thirty-two dollars per ounce. There is plenty of gold in the gravel, but on account of the slow process and the time consumed in fanning it out a man would only average two to four *adarmes** of gold a day. One *adarme* is worth about $2 silver. So far, only about 75,000 dollars worth of gold had been taken out *in all.* It will thus be seen that only those content with the very poorest wages can be satisfied with the diggings. Many of the miners were Indians from the mainland. The rest were Mexicans from the mainland and the peninsula. Only one hundred Americans had been to the mines at one time. More miners had returned than were remaining. Still, it is my opinion that these placers will be worked for many years to come by Mexicans, satisfied with gaining

* The *adarme* is the sixteenth part of an ounce.

a net profit of from fifty cents to one dollar a day. The placers were rediscovered in the summer of 1898 by some Mexican miners. There had always been rumors that in former years, during the time of the Missions, the Padres had received large quantities of gold from this region, through the Indians. At the time of my visit there was no one to collect a tax on the claims, and any one could dig wherever he pleased. If there had been running water for washing the gold, there is little doubt but that these mines, which now pay so poorly, would have been famous and immensely profitable.

The climate of the promontory, including the Santa Clara and Sierra Pintada mountains, is not by any means as mild as might be expected from its southern latitude. Fogs are persistent during the spring, and high winds are not uncommon. Miners who did not provide themselves with heavy covering have complained of various ailments—rheumatism, etc. The situation of the promontory is such as to catch all the fogs and high winds which pass down the coast with the northwest trade winds. The low desert plain situated between the coast mountains and the sierra favors a draft, which causes the winds to sweep over this country with unusual force. The promontory, which runs in a direction north and west, consists of at least two distinct mountain ranges. The southerly one is known as the Sierra de Santa Clara, while the more central one bears the name of Sierra Pintada. The two ranges are connected by low hills and by table mountains. Seen from a distance, one can readily make out that the two ranges or sierras are quite distinct. The placers were at first called the Santa Clara placers, but little by little the name of Sierra Pintada seems to have been adopted. As a fact they are not situated in the Santa Clara range, but in the Pintada.

When I was in the region a large number of copper claims had been located, and some ore proved to be very rich; but it remains to be seen if it can be mined, the scarcity of water and fuel being the main difficulties. The fuel question may be solved by the importation of anthracite coal from Sonora; but it is difficult to see how water can be procured where natural springs are so few and so poor in quality. Near the shore-line water may, however, be had almost anywhere by digging shallow wells. Such wells have now been dug both at San Roque and at Asunción. But they are situated on the very beach, and would be too far distant from the mines.

8. Mountain Peaks.—As has been already stated, the central part of the peninsula is traversed by a sierra or mountain chain, from which rise a large number of sharp and beautiful peaks. This main

sierra is situated much closer to the Gulf coast than to the Pacific. On the maps which have been published only a few of these peaks are indicated by names. In order to supply this want I tried to ascertain the correct names of as many peaks as possible, though I had only opportunity to ascend one or two of the lower ones. I have marked these names on the map, the spelling being that used in a Mexican Saints' Calendar. The elevations given are those marked on the U. S. Hydrographic Charts Nos. 219, 220, 221, and are only approximately correct.

Beginning in the south and proceeding northwards, I ascertained the names of the following peaks visible from the coast or from the trails along which we passed:

San Francisco, 1,578 feet, west of San José island.

San Miguel, 2,514 feet, west of Habana island.

La Cafetera, 2,118 feet, west of Sta. Cruz island.

Alta Gracia, 4,773 feet, west of Danzante island.

La Palmilla, 4,660 feet, west of Puerto Escondido.

Tabor, 4,151 feet, west of Carmen island.

Victoria, 3,756 feet, west of Carmen island.

Las Parras, 3,674 feet, west of Loreto and immediately north of the road to Mission San Xavier.

Carrizal, 4,148 feet, north of Las Parras.

Agua Verde, 4,920 feet, north of Carrizal.

La Giganta, 5,794 feet, north of Agua Verde.

Los Encinos, —— feet, north of La Giganta.

Las Cruces, —— feet, north of Los Encinos.

Carrizal, 2,716 feet, north of Las Cruces.

Guajademí, 3,943 feet, west of Concepción Bay.

Zacatecas, 3,710 feet, north of Guajademí.

The last two are the most prominent peaks in this region.

Passing in a half-circle to the north towards Santa Rosalia and Las Virgenes, the following peaks are situated almost in the centre of the peninsula, and are probably seen from both the Gulf and the Pacific Ocean:

San Vicente, 3,890 feet, west of Guajademí.

San Joaquín, —— feet, west of Guajademí and Zacatecas.

El Valle, 4,212 feet, at the head of the arroyo San Juan.

Las Cañadas and Las Palmas, both very prominent peaks, north of El Valle and at the head-waters of San Juan and San Pedro.

El Puro Año, 5,828 feet. This is the highest mountain in the central part of Baja California. The whole mountain chain on which this and many other peaks are situated is known under the general name of Sierra de las Palmas.

Las Palmas is generally supposed to extend from the vicinity of San Pedro, in the north, to El Valle, in the south. From El Valle southwards the sierra is known as Sierra del Valle.

San Pedro. A very high cluster of peaks, situated north of El Puro Año and east of Patrocinio, and at the head-waters of San José Magdalena, which latter arroyo opens in the Gulf.

San Tadeo, or El Pilón de San Tadeo. A most remarkably-shaped peak, situated north of San Pedro, and sufficiently isolated to be seen from many sides.

La Trinidad. A prominent peak north of San Tadeo.

Santa Isabel. A cluster of peaks or sierra, of which La Bandera is the highest point. La Bandera is not a sharp peak, but a high, rounded crest which, when seen from the west, has something of the shape of a flowing banner; a sharp peak at its very northern end, recalling the staff of the banner—hence the name. It is uncertain which of the peaks marked on the map is intended for La Bandera, but it is possibly the one marked 5,202 feet. It must be remembered that only a few of the more prominent peaks were measured by the U. S. Government Survey and marked on its charts.

Santa Maria. A peak east of the Cerro de la Bandera, situated at the head of a large arroyo of the same name and flowing into the Gulf.

La Ascensión. A high sierra north of La Bandera.

Santa Cruz, north of La Ascensión.

Santa Lucia, north of Santa Cruz. North of Santa Lucia there is a great depression in the sierra, through which leads the road to Santa Rosalia.

San Ignacio. North of this pass we have the beautiful mountain complex known as Las Virgenes. This consists of three prominent peaks—Las Tres Virgenes. The central one of these is an extinct or semi-extinct volcano, known as El Volcán. It is said to give off at times strong sulphur fumes and a number of steam geysers, indicating that the internal heat is not quenched.

Cerro Colorado. A reddish-colored mountain immediately north of San Ignacio.

Picacho de Santiago, 3,764 feet, is the most prominent peak north of San Ignacio, and can be seen from that point.

Sierra de San Francisco. This is the very highest sierra seen to be situated north of the Picacho de Santiago.

Natividad. An isolated mountain peak, situated well out on the plain west of Picacho de Santiago.

It may not be inappropriate to state that in Mexico, and especially in the peninsula of Baja California, a "sierra" is an isolated mountain, which is separated from its neighbours by deep cañons and plains or by lower hills. Thus, the mountain chain from one end of Baja California to the other is a succession of different "sierras," each one of which possesses a different name. A general name for the whole mountain backbone is not in use. In Alta California the continuation of this backbone is known by one name—Sierra Nevada—but in Baja California no such general name is in use.

As regards the geological formation of the mountain peaks little is known. From my own few observations, it appears that the majority of the peaks consist of granite, their sides being covered with a blanket of trap. At one place, where the trail passes the foot of the peak, Las Parras, on the road between Loreto and San Xavier, a most interesting geological formation was observed. Enclosing the pass are immense walls of trap, beyond which the granite peak is visible. On the south side of the pass, at its highest point and close to the road, I found this trap rock to be full of large and

small veins of granite. One of the largest veins could be distinctly followed for several hundred feet up toward the granite peak; and there can be no doubt about the nature of the vein. In this instance the granite is, accordingly, of very recent formation, having in a liquid state filled cracks in the trap rock instead of *vice versa*, as is generally the case. The granite veins are distinct and well defined, and their proximity to the main trail through the pass will make it easy for any one interested to verify this statement as regards their nature.

The immense trap covering, which has spread over the central part of Baja California, has been referred to several times in this paper. It must have been of a recent geological time, probably of the same age as in California. The arroyos or water-courses must have had previous to the great eruption of trap, to some extent, the same position as now. The walls of the present arroyos—at least many of them—consist of trap rock, hundreds of feet thick. Towards the mesas this rock diminishes in thickness, and it appears plain that the thickness in the arroyos is due to the fact that the eruptive trap followed previous depressions and arroyos, which, to a great extent, coincided with the present ones.

To this rock is due the formation of nearly all the mesas, so very characteristic of the region. The hard trap has protected the underlying layers and prevented erosion. The nature of the cañons and arroyos is also due to this rock. Nearly every arroyo is lined by perpendicular walls of blackish trap, forming a smooth and even rim at the top—the natural border of the mesa.

9. Lagoons or Esteros.—El Ranchito.—This is the large lagoon is marked on the U. S. Government maps as San Ignacio Lagoon. This latter name is not recognized or even known in Baja California, and when I inquired for such a place no one understood what was meant. The lagoon, as well as the whole of the surrounding country, appears to be in a state of elevation—the lagoon itself becoming smaller and smaller even during recent years. The sandy plains around it, which occupy an immense territory, appear to have lately risen from the Pacific.

El Coyote.—This is the name of the next largest lagoon of this part of the country near San Ignacio. It is situated a little to the west of El Ranchito, and is only one-third as large as the latter.

Ojo de Liebre.—This is the real name of the large lagoon known in the United States maps as Scammons Lagoon. This latter name is not used by the inhabitants of the country, and is not even

known, except to a few sea captains who have had the use of the United States maps. The Mexicans do not use the name laguna (lagoon), but designate these three lagoons simply as El Ranchito, El Coyote and Ojo de Liebre. The lagoon known as Black Warrior Lagoon is so named after a vessel which was stranded there many years ago. The Mexican name I could not ascertain.

10. Possible Colonisation of the Peninsula.—One of the first questions asked by those who are interested in the agricultural improvement of the peninsula of Baja California relates to the possible colonisation of the country by foreign immigrants. So far many efforts have been made to induce settlers to come and develop the latent horticultural resources of the country, but nearly, if not all, of these have failed of success. It is but natural to think that a territory so immense as that of Baja California should possess many places sufficiently productive to induce and attract agriculturists from abroad. I think the chief error committed has been that of self-deception and an over-estimation of the constancy of the rainfall of the peninsula. In the foregoing pages I have endeavored to show that while the rainfall is at times sufficient or even abundant for the raising of crops, periods of drought are so frequent that no reliance should be placed on the constancy of the rain. Every colonisation enterprise in the peninsula has been started during or after a period of unusual precipitation, and, similarly, rain has failed during a following period of drought. People visiting Baja California during years of good rainfall can hardly help being struck by the productiveness of the country and the salubrity of its climate. Ignorant of the true climatic conditions, which are sure sooner or later to manifest themselves, they suppose that this fertility is recurrent yearly, when in fact it should be rated as an exception. The rolling hills, which for a year or two will produce splendid crops of grain, are almost certain to remain barren for several years following. From this it follows that no crops are assured which rely upon the natural precipitation alone. In the mountains there are, of course, yearly and sufficient rains, but on account of their distance such places are for the present unsuitable for permanent settlement of agriculturists. But the water which falls so freely in the sierra might be used elsewhere in the form of irrigation; and this alone can make agriculture a permanent success on the peninsula. As all springs and streams of any importance have already been occupied and utilised for this purpose, it is evident that some other means must be resorted to in order to extend the

settlement of the country. Even a casual observer will see that wherever irrigation is practised it is of the very crudest kind. Nowhere are any large and permanent dams made, nowhere is the land terraced or even levelled, and nowhere do we find any cemented ditches which would husband the water while carried from one place to another. There is certainly not a single water-course in the peninsula which could not be made to treble or quadruple its irrigation capacity through the construction of proper irrigation works. In order to make any settlement a success, the first requisite is the construction of such irrigation works, and agriculturists should not be induced to settle there until such works have actually been constructed and put in operation. The procuring of land suitable to agriculture is the least difficult part. There are hundreds of large arroyos all over the peninsula which offer the choicest bottom-lands to the irrigator, but until dams and ditches are in operation even the choicest of these lands will remain unsuitable for settlement. In many places water for irrigation may be had by pumping; but as wood is scarce, and as oil and coal are not yet utilised, this manner of raising water cannot be resorted to at present. Irrigation works can only be constructed by rich corporations and by Government aid, and the motive which will induce such constructions will be the profit to be derived. This question of profit is one that will be answered differently according to circumstances, as what will not pay to-day may be highly profitable to-morrow. The exploiting of oil, coal and minerals of various kinds, in which Baja California is indisputably rich, will no doubt in time create a demand for supplies which can best be procured in the immediate vicinity where they are needed. When such time comes—and in places it has already come—then there will be profits in the expenditure of money for irrigation works, and settlers will not be disappointed in their expectations. The geniality of the climate of the peninsula is so unsurpassed that it alone should attract the attention of the world. While no one can live on climate alone, as the saying is, it is not less certain that climate, land, and irrigation will in time combine to make Baja California a desirable place for settlements.

11. Approximate Distances from La Paz to San Ignacio by the Central Trail.—

La Paz to Zacatal, 1 league.
Zacatal to Arizpes, 2 leagues.
Arizpes to Quelelé, 2 leagues.
Quelelé to Rodriguez, 2 leagues.
Rodriguez to Cajon de los Reyes, 1 league.
Cajon de los Reyes to Mesa de la Vieja, 5 leagues.

Mesa de la Vieja to Cerro Colorado, 1½ league.
Cerro Colorado to Arroyo de San Hilario, 2 leagues.
Arroyo de San Hilario to La Junta, 2 leagues.
La Junta to Arroyo de San Gregorio, 2 leagues.
San Gregorio to Cerro de los Liebres, 3 leagues.
Cerro de Los Liebres to Arroyo Iritú, 5 leagues.
Iritú to Plátano, 2 leagues.
Plátano to San Luis, 2½ leagues.
San Luis to Frijol, 2 leagues.
Frijol to Ranchito (situated in the same arroyo), 1 league.
Ranchito to Tepentú, 5 leagues.
Tepentú to Batequitos, 2 leagues.
Batequitos to Los Cerritos, 3 leagues.
Cerritos to Arroyo del Quepo, 4 leagues.
El Quepo to Jesus Maria, 4 leagues.
Jesus Maria to Aguajitos, 3 leagues.
Aguajitos to San Rafael, 1 league.
San Rafael to Posa Miguel, 5 leagues.
Posa Miguel to San Lucas, 5 leagues.
San Lucas to Posa Teresa, 4 leagues.
Posa Teresa to San Francisco Xavier, 5 leagues.
San Francisco Xavier to Santa Rosalia, 3 leagues.
Santa Rosalia to El Quiñí, 2 leagues.
El Quiñí to Comondú, 2 leagues.
Comondú to San Vicente, 7 leagues.
San Vicente to La Purísima, 2 leagues.
La Purísima to Purísima Vieja, 2 leagues.
Purísima Vieja to El Paso Hondo, 2 leagues.
Paso Hondo to San José, 3 leagues.
San José to Guajademí, 5 leagues.
Guajademí to El Potrero, 4 leagues.
El Potrero to Mulejé, 10 leagues.
Mulejé to San Marcos, 9 leagues.
San Marcos to San Bruno, 3 leagues.
San Bruno to San Lucas, 2 leagues.
San Lucas to Santa Rosalia, 2 leagues.
Santa Rosalia to San Xavier, 2 leagues. (Not the Mission San Xavier.)
San Xavier to Santa Cruz, 3 leagues.
Santa Cruz to San Ignacio, 10 leagues.

12. Distances from Mission San Xavier to San Ignacio by the Western Trail.—

San Xavier to Comondú, 9 leagues.
Comondú to Pabellón, 2½ leagues.
Pabellón to San Vicente, 2 leagues.
San Vicente to Purísima, 2 leagues.
Purísima to San José, 4 leagues.
San José to El Mezquital, 5 leagues. (No water.)
El Mezquital to San Juanico, 2½ leagues.
San Juanico to Carrizal, 2½ leagues.
Carrizal to Cadejé, 1¼ league.
Cadejé to San Raymundo, 2 leagues.
San Raymundo to San Juan, 2 leagues. (No water.)
San Juan to Los Dolores, 1½ league. (No water.)
Los Dolores to Arroyo de las Vacas, 1½ league.
Las Vacas to San José de Gracia, 1 league.
San José de Gracia to San Benito, 3 leagues.
San Benito to Patrocinio, 2½ leagues.
Patrocinio to Jesus Maria, 3½ leagues.
Jesus Maria to San Joaquín, 8 leagues.
San Joaquin to San Ignacío, 2 leagues.

12. Distances from San Ignacio to Calmalli (variously spelled Calamajé, Calamujé, Calamahi).—

San Ignacio to San Juan, 2 leagues.
San Juan to Higuera, 2½ leagues.
La Higuera to Natividad, 1½ league.
Natividad to San Estéban, 1 league.
San Estéban to Ascensión, ½ league.
Ascensión to San Pablo, 8 leagues.
San Pablo to Santa Gertrúdis, 5 leagues.
Santa Gertrúdis to Arroyo del Cerro, 4 leagues.
Arroyo del Cerro to Campo Aleman, 9 leagues.
Campo Aleman to Calmalli, 2 leagues. (This name is of Indian origin.)

14. DISTANCES FROM SAN IGNACIO TO SAN ROQUE.—

San Ignacio to San Angel, 5 leagues.
San Angel to Tinaja de Santa Clara, 15 leagues.
Tinaja de Santa Clara to San Lorenzo, 3 leagues.
San Lorenzo to Cerro Prieto, 10 leagues.
Cerro Prieto to San Rafael, 5 leagues.
San Rafael to Los Placeres, 5 leagues.
Los Placeres to San Andrés, 6 leagues.
San Andrés to San Roque, 4 leagues.

15. PLACES ON THE DIRECT ROAD BETWEEN SAN LUCAS AND LA PAZ.—

Cabo San Lucas.
La Mojonera.
El Tulí.
El Bledito.
Cerro Colorado.
Matancita.
Pozo de Gonzales.
Cerro Blanco.
Palmilla.
Salate.
San José del Cabo.
Santa Rosa.
Zacatal.
San José Viejo.
San Bernabé.
Catalina.
Las Veredas.
San Joaquín.
San Pedro.
Agua Verde.
Santa Anita.
La Laguna.
El Desecho.
Salto.
La Palma.
Caduaño.
Miraflores.
El Chinal.
Cuesta Blanca.
Juamuchilár.
Matancita.
Santiago.
La Capilla.
Mesa del Cuero.
Buena Vista.
Tecolote.
Piedras Gordas.
Ensenada de Palma.
Los Cantiles.
Palo Blanco.
Coral Viejo.
San Bartolo.
Rodeo.
Agua Blanca.
San Antonio.
El Triunfo.
San Pedro.
La Paz.

16. PLACES FROM SAN JOSE TO TODOS SANTOS.—

San José del Cabo.
El Encinalito.
El Guayabo.
El Tulí.
Las Parras.
San Miguelito.
La Mesa Verde.
Candelaria.
La Calera.
Los Encinitos.
San Jacinto.
Palmar del Medio.
Pescadero.
Los Lobos.
Todos Santos. (Not to be confounded with the Todos Santos bay, situated near Ensenada, in the northern part of the peninsula.)

THE LAPPS OF SWEDEN.

BY

E. D. WINSLOW, STOCKHOLM.

In the northern provinces of Sweden and Norway live the Lapps. In many districts and communities they constitute the majority of the population by a large degree; yet, like the Indians on our former western borders, the Lapps show signs of a sure disappearance. The march of our modern civilisation has already set in towards the far north, the wealth of the mines is beginning to be sought, and contact with the white man seems to alarm the sturdy little nomads of the Arctic Circle. In the year 1885 the population of the Swedish Lapps was given out officially as 5,955; while in 1895 the latest figures obtainable indicate that this number has sunk to 5,576.* The County Boards, who have compiled these figures, do not give any reason nor explain in any way the cause of the diminution of the population of the Laplanders. I compare them to our Indians in many things. Like them, they do not till the fields nor live in houses. They subsist chiefly on fish and the flesh of the reindeer. In the winter they live in snow-constructed protections, and in summer tents of skins, with an opening at the top for the escape of smoke, keep them comfortable according to their notion.

The Government wishes to protect the Lapps and at the same time not to interfere with the development of the country and the opening up of that vast region in the Arctic Circle filled with iron, copper and other minerals. Railroads now pierce the former unknown tracts, mines are being developed, prospectors are searching for new treasures, and new cities are springing into life.

The Lapps are short of stature, with high cheek-bones, and seem closely allied to the Mongolian type of mankind. Their wants are few, they are semi-civilised, and the progress of the world at large is of little consequence to them. The Swedes, Norwegians and Finns are supplanting them.

The Swedish Government has enacted laws which apply directly to the Laplanders, and which it was thought would protect them in

* The Swedish Lapps numbered in 1890, according to the *Almanach de Gotha* for 1900 (p. 1101), 6,846. An exact return of such a population is hardly to be expected.

their rights and privileges. Since the year 1886 there has been in force a law passed by the Parliament, setting aside a certain territory in the extreme north for the use of these interesting people. Sections of this territory were to be theirs, for their reindeer and for their homes. But, as with us in the case of the Indian, the County Boards have been continually at work endeavoring to curtail the effect of the law and to hinder its enforcement.

Civilisation cannot exist with semi-civilisation; tilled fields and herds of cattle cannot be neighbors to untilled wastes and droves of reindeer. The wealth of the Lapp consists of his reindeer, and the beast does not seem to thrive as a wholly domestic animal. It is estimated that there are nearly 200,000 reindeer in Sweden alone. The animals are moved about from place to place—in the mountains during the summer and into the valleys during the winter. They rest no long time in one place, and are continually on the move. They are the buffalo of Sweden. The hide clothes the Lapp, the flesh feeds him, the milk furnishes him with cheese, and the young animals draw his sleighs.

The Government has its little problem to solve. It wishes to be just to all its people and yet not hinder the onward movement of civilisation. The proper protection of this good and harmless people is a serious question. To own and raise reindeer is not compatible with the life of the homesteader. The building of railways and the development of mines soon destroy the hunting-ground of the Lapp. The harnessing of the waterfalls, in which this northern country abounds, will destroy the fish.

It would seem almost certain that the Lapp is doomed to extinction, notwithstanding the care and protection that the Government is endeavoring to give him. With his departure will go an interesting member of the human family. He has lived on about the only part of the earth's surface that was the most uninviting. It has been thought possible to move them in colonies to Spitzbergen; but reindeer cannot exist on that island. Science, if it wishes to acquaint itself with the Lapp, his work and daily life and his language, must make the researches without any loss of time, for he is slowly being absorbed, his individuality is disappearing, and the characteristics of the race and the language will soon be found only in history.

EXPLORATIONS IN THE RUBBER DISTRICTS OF BOLIVIA.

BY

BARON H. ARNOUS DE RIVIÈRE.

In the year 1892 I wrote an article for the Geographical Society at the request of Judge Daly, president of said Society, upon my explorations in the Beni Province of Bolivia. That province, so long unknown, and yet containing so much treasure, had never been thoroughly explored, and there were no maps to be referred to.

The principal object of the paper was to give an approximate description of the country and some maps indicating the course of the rivers, showing the necessity of cutting a road between the Beni and the Lake Titicaca.

At that time the main interest was the working of the gold gravel in the rivers and the culture of the *Calisaya* (quinine bark). This last culture was losing its importance more and more every year, because the quinine trees were getting scarce by the destructive way of cutting them down used by the Indians, and the planters were discouraged and gave up planting the trees when it was shown that the calisaya in India was yielding to the English its bark at a lower rate in production and freight.

As for the gold gravel, it was not worked to any extent, as the different enterprises had never been backed by sufficient capital or competent men. No attempt had been made to work the quartz veins, save, perhaps, in Poto, in the Cordillera north of Lake Titicaca, and in Carauaya, which is now a marvellous gold-yielding district, easily reached by the road leading from Juliaca to Azángaro and Sandia.

But it became rumored by those who were clearing the forest that gum trees (caoutchouc) were abundant and were wantonly cut down by the Indians and the settlers, who knew not how to extract the gum without killing the tree. Carlos Peña, who was working the hacienda of San Antonio, on the Villianoa stream, was, I believe, the first man on the Mapiri river who smoked the gum. The smoking is done by lighting a fire of the very fruit of the tree, which gives a dense smoke. The liquid gum is then spread on a wooden shovel in the form of a pancake and presented to the smoke. The pancakes, when well daubed with soot, are piled up one upon

MAP

TO ILLUSTRATE PAPER ON

RUBBER DISTRICTS OF BOLIVIA

By H. Arnous de Rivière

Toraco
Huancane
Villachica
Moho
Comina
Juliaca
Italaque
Huaichu
LAKE
TITICACA
Puno
Acera
Chuquito
Nongo
Juli
Copacabana
Pomata
Sepita
Desaguadero
Huaqui
San Pedro
TUNGUYO
San Pablo
Escoma
Combaya
Sorata
Illabaya
Carabuco
Ancoraimes
Sotolaya
Achacha
HACHACACHE
Huarina
Illampu
Amargurani
Palmar
Tolapampa
Concha
Injenio
Tornillo
Yani
Tusuaia
Pampoma
Capauaya
Kilapituni
La Joya
Hupo
Puri
R. Quirini
R. Paiti
HACIENDA DE CHALLANA
ACHILA
TARUPARA
Challana
Harca
R. Zongo
Zongo
Sta. Rosa
Humapampa
Canaviri
Hualna Potosi
Milliuni
RINCONADA
Aigache
CART ROAD
Chillillaya
Pucarani
TIAGUANACO
NARROW GUAGE RAILROAD
Laya
LA PAZ
R. Chuquiaguillo
R. de la Paz
R. DESAGUADERO
Jesus
Viacha
Coniri
PROJECTED RAILROAD TO TACNA
RAILROAD TO ORURO & ANTOFOGASTA
PROJECTED EXTENSION OF THE AREQUIPA & MOLLENDO RAILROAD
San Andres
Nasacara
-16-
68
E. F. Fisk, Engr., N. Y.

another until they form a mass weighing from 75 to 80 pounds, which is wrapped up in rawhide or heavy canvas. The smoking must be done within two or three days of the collecting or the juice granulates. The samples thus sent by different owners of the gum trees were a success, and all at once there was a demand for all that could be gathered.

The cutting down of the trees was strictly prohibited, and all along the Mapiri river and the Beni the Indians began tapping the trees and selling the gum in Sorata.

In Churumani, the big hacienda belonging to Sr. Goitia, Senator for La Paz, the calisaya (quinine) was almost abandoned, and all the labor directed to the gum.

The bark of the best Bolivian quality, treated in Europe, never gave more than eight per cent. of sulphate of quinine. It seems strange that no effort has ever been made to extract the sulphate in the country where it is produced, thus avoiding the payment of heavy freight on 92 per cent. of dead weight, besides damaging the quality by fermentation on the sea.

This is more remarkable when it is known that a great deal of sulphate is shipped from Europe to South America, where it commands a heavy price, Bolivia being the main producing country.

As soon as it was known that the house of Brayard had settled on the Madre de Dios, another French house (Devez) established itself lower down on the Mamoré, and later a German firm occupied Ribera Alta. The difficulty first encountered was the scarcity of hands, the Indians being very uncertain and unsteady—so much so that without giving any notice they would leave and float up or down the river on logs before their contract was at an end. The only way to keep them was to allow them to run in debt at the company's storehouse and to keep a guard who would watch and prevent their running away. But some of them, having managed to escape, told the northern Indians that it was not safe for them to navigate the river below the establishments, as they would be seized and turned into slaves.

All the gum obtained was shipped down the Mamoré and the Amazon, consigned in Pará and went to the European and United States markets under the name of Pará gum, when in reality it was Bolivian gum. It is difficult to understand that a product so easily packed, and in such demand, should be made to travel over three thousand miles, most of it through a country foreign to the production.

Both the railroads, that from Antofogasta to Oruro and the one

from Mollendo to Puno, have their termini only a hundred and fifty miles from the gum-producing country, and yet no serious effort has been made to build the proper roads from the Beni to the Pacific.

It was under those circumstances that in the year 1893 a company was formed with a capital of $500,000, its object being to secure a Gum Alliance and to build a road under the patronage and with the help of Bolivia. This company was well organised, three of its directors being well-known gum brokers and the manager being thoroughly acquainted with the country and its resources.

The company was called the Beni Gum Company, and it was duly incorporated in New York.

An expedition was organised, all the machinery and the goods that could be of any use in the forest were purchased, packed and shipped to Mollendo. The manager and one of the gum brokers, as well as one of the directors, sailed for the Isthmus, and from Panama to Mollendo, and from there reached La Paz by Arequipa and Puno. Unfortunately, the manager was detained on the road, and only reached La Paz ten days after the others.

Now, some merchants in La Paz dreaded exceedingly the competition of the Yankee company—and with reason, for they could not bring on the market such a selection of goods as was coming. They united in trying to break up the Gum Company, taking advantage of the manager's absence to discourage the directors by telling them that they had been deceived; that there were no gum lands on which they could form an establishment; that the perils of the voyage to the Beni were such that only mad adventurers would attempt it; that the manager was one of these; and that, in fact, if they wanted an interest in gum, they could establish an agency in La Paz, offering their services.

When the manager arrived he learned that the directors in La Paz had telegraphed to the directors in New York their intention to break up the company, and, unfortunately, at the same time the chief broker became demented and had to be sent back to New York by the American Minister under a proper escort. The other director, having no desire to affront the "*perils*" of the trip to the Beni, remained in La Paz only the time necessary to deposit the goods in a German house, borrow money on such security, and return to New York. Shortly after the German house failed, and the company was ruined.

Had it fulfilled its programme it would now be worth millions, for this expedition had awakened the energies of the people, and a

great number petitioned for concessions from the Government for gum lands, which could then be obtained for the payment of taxes, and which are now worth thousands and hundreds of thousands pounds sterling. Rapidly the province was invaded by prospecting men, and the Government adopted a rather singular way of measuring out its concessions. A *pertenencia* (or claim) was not measured by the area but by the number of trees; one hundred and fifty being the unit. This may in the future be troublesome for neighbors.

Up to this time only the borders of the different streams are in exploitation. It is yet difficult to penetrate in the wild forest, where there are no paths. It is time yet to obtain possession or control of extensive gum-bearing land, but this opportunity will soon be lost.

At present the traffic to the Beni and to La Paz is concentrated on the Pacific Ocean at the port of Mollendo—a miserable and unsafe open harbor, but the terminus of the Arequipa and Puno railroad. From Puno the goods and passengers navigate the Lake Titicaca and land in Chillillaya or Desaguadero.

In Desaguadero there is an indirect path going about 100 kilometres to La Paz by Huachi and Laya, and the Government has just contracted with French capitalists and engineers to lay down a railroad that will do away with the very badly-kept road from Chillillaya to La Paz.

When I left, six months ago, there were accumulated in the Custom-house of Chillillaya over fifty thousand quintals of goods to be transported to La Paz. All the available means of transport could not move more than three thousand to four thousand quintals per month, and the accumulated deposit was augmenting at the rate of two thousand or three thousand more per month. The railroad will be a success, and will rapidly pay for its cost.

The new port of Huachi, on the Desaguadero, will be in communication with the Corocoro district, and will have the transport of the copper ore.

The actual miserable cart-road from Chillillaya to La Paz will be abandoned, and will only be used to reach Sorata by Hachacache.

Sorata will remain the deposit of such goods and the traffic coming from the central northeast fields of the Mapiri river.

As soon as the railroad is opened from Desaguadero to La Paz there will be built a connection from Puno to Desaguadero, and the navigation of the lake will be considerably shortened.

We must now go back to the labor question, for it is the basis of

the gum interest. We have said that it was impossible to obtain sufficient labor from the native Indians.

The Aymara Indians live on the high lands west of the Cordillera, and do not endure the tropical climate of the eastern low land. They will not contract for more than a few weeks at a time. An experiment was made to introduce Japanese labor, but it did not prove successful. That class of immigrants is very troublesome and unreliable. The negroes are the only people that will accept steady occupation. We had the experiment made in the black colony of Tipuani. The little village was entirely composed of black men of the third generation, originally runaway slaves from Brazil. They were the only men in the Mapiri valley on whom we could depend for clearing, cultivating or building. The Indian does not work—he fishes, hunts and navigates the streams, and lives by the fruits he raises and the gold he washes from the banks of the streams.

I believe that never was there such an opportunity offered to the black race to form a prosperous colony and be independently happy.

The advantages offered to the emigrants are the following:

First: A contract between the emigrant and the employer for four consecutive years, to date from the day of signature of said contract;

Second: All travelling expenses paid to the place of labor;

Third: Four acres of land given to each laborer to establish his house and garden;

Fourth: All material and facilities given free for the erection of house and clearing the site. If several in a family, all advantages to be multiplied by the number of working hands, women and boys above 15 years to be considered as able laborers (the work is light and easy);

Fifth: Wages in money for each worker, twenty dollars per month;

Sixth: At the expiration of the four-year contract the house and land belong definitely to the emigrant.

Full protection from the Government according to the emigration and colonial laws of the country. The emigrants can retain their rights as American citizens if they come from the United States, and as such can claim protection from the United States Minister residing in La Paz.

The work, I said, is an easy and light one. It consists in clearing the wild forest by cutting down the trees that are not gum and

fruit bearers, such as coffee, cacao, quinine bark, orange, cotton, etc. The gum trees are tapped like maple sugar or acacia trees.

The men can also be employed in cutting and clearing roads and in washing gold; the girls being the best fitted to work the pan.

The workmen begin work at 5 A. M. and knock off at 12 or 1 P. M. They have all the rest of the time to themselves.

An able man or woman laborer can easily gather one hundred and fifty pounds of gum per month.

The cost of wages and expenses is fifty-eight Bolivian dollars per month. The market price of gum, paid at the place of production, is one hundred and eighty Bolivians per quintal. Therefore, one quintal and a half, produce of one workman's labor, will yield two hundred and seventy Bolivians, giving monthly a clear profit of two hundred and twelve Bolivians per laborer.

The Bolivian dollar is, more or less, worth fifty cents American money; therefore, the product will be one hundred and thirty-five dollars, the cost fifty-eight Bolivians (twenty-eight dollars), and the profit one hundred and seven American dollars. One thousand emigrants will pay monthly about one hundred thousand dollars ($100,000) American money.

The production of gum coming from the Beni to the Pacific is not yet well known; but it develops rapidly, and it is expected, as soon as the projected roads are in operation, to multiply in proportion to the demand. On the other gum-fields—Peruvian and Brazilian—in the year 1894, the production in February was as follows:

	KILOS.
On the Purus River	527,571
On the Jurua	280,249
On the Javari	200,278
On the Madeira	165,003
On the Rio Negro	50,937
On the Solimões	43,196
On the Jutahy	11,380
On the Amazonas	830
Total	1,279,444

or one thousand two hundred and seventy-nine and one-half tons.

Since then the demand and the price have greatly advanced.

Other countries are now awakening to the great resources available in the gum-gathering, and they are planting and cultivating wherever the soil is favorable. New Granada, on its low lands of the Darien, Venezuela, the Guianas, and Ecuador will compete in

the market. But it takes twenty years to develop a rubber tree, and until then the forests of Peru, Bolivia and Brazil must supply the demand.

A year ago we received from the acting Governor of Surinam the following letter and document:

SURINAM.

PARAMARIBO, November 6th, 1899.

SIR:

I have the honour to ask your attention for the following concerning the trees producing India-rubber or caoutchouc, growing in the South American republics, Brazil, Peru, Bolivia, and Ecuador.

As you will perceive from a report by the Superintendent of the Botanical garden at Kew (Kew Bulletin of Miscellaneous Information, Nos. 149 and 150 of 1899), a copy of which I have the honour to enclose herein, these trees belong to the species of Hevea and Castilloa. The rubber from the Castilloa, called *Caucho*, of which caoutchouc is probably an expanded form, is collected by felling the tree, and that from Hevea called *Yebe*, *Yeve* or *Heve*, by tapping.

With regard to the fact that the demand for caoutchouc is increasing every year, it seems an important matter for a colony like Surinam to try to cultivate those caoutchouc-producing trees.

In order to make a trial with the cultivation of the said trees in our Botanical Garden at Paramaribo, I beg to ask your kind intermediation to forward to me if possible some seeds and young plants of Hevea and Castilloa.

In case you succeed in getting young plants the best packing to guard them against injury, as I am informed, is a tin-plate box filled with damp saw-dust.

I hope you will be so kind as to help me in this matter. The expenses which eventually are to be made in procuring and forwarding the seeds and plants will of course be refunded.

I have the honor to be Sir,
Your obedient servant,

Acting Governor of Surinam.

(enclosure.)

Afschrift.
Royal Gardens, Kew,
May 23rd, 1899.

SIR:

I have the honour to acknowledge the receipt of your letter of May 12th transmitting a copy of Consul Churchill's report on a kind

of India rubber exported from Peru, through Pará, under the name of Caucho.

2. Caucho, of which Caoutchouc is probably an expanded form, has been hitherto identified with India rubber *par excellence*, the produce of one or more species of Hevea indigenous to the basin of the Amazon, and exported from Pará. According to the information now received, the Caucho tree of Peru is a Castilloa. One or more species of this genus produces the India rubber of Central America. The South American Castilloa has been known to extend as far as Ecuador, where it is called "Yebe," otherwise Yeve or Heve. According to Aublet this latter name was given in Northern Ecuador to a species of Hevea, and in founding that genus he desired to name it accordingly. In the Amazon basin the name for the species of Hevea is "Seringa," and in Central America for those of Castilloa "Ule," or "Tunac" (see Kew Bulletin, 1898, 141, 142). Perhaps in Western South America the names Caucho and Yebe are applied indiscriminately to rubber-producing trees.

3. According to a report by Mr. M. B. Adamson, H.B.M. Consul at Iquitos, dated December 24, 1898, and published in the transactions of the Liverpool Geographical Society for the same year, Peru has two kinds of rubber-producing trees: Caucho, which appears to belong to Castilloa, and Yebe to Hevea (pp. 39, 40). Both Mr. Adamson and Mr. Churchill agree that the rubber is extracted from the caucho tree by felling. The Yebe is always tapped. The former process results in a district being worked out. In consequence, according to Mr. Adamson, many of the "Caucheros," or rubber collectors, are working on Brazilian rivers, where the supply is yet more plentiful.

4. It is not, however, necessary to fell the Castilloa trees to collect the rubber. The method of tapping is minutely described in a report in the United States Consular reports for May, 1899 (pp. 150 and 151).

The estimated yield per tree is much smaller than that given in Sir Henry Deling's report, as to which I addressed some inquiries to the Foreign Office in my letter of April 14th, 1897.

I am, Sir,
Your obedient servant,
W. F. Thiselton Dyer.

There are no signs just now of any diminution in the demand for rubber, and, therefore, for years to come the gathering of gum will be a source of great fortune for those who will go to work at once.

Importation of black labor and opening of thoroughfares—removal of the obstacles in the rivers—establishment of laborers' villages and of working capital—will give enormous results.

Companies will be formed capitalized at the actual low value of the forest lands, and they will obtain dividends of one hundred per cent.

The country has been calumniated so far as its salubrity goes. It is not true that fever is prevalent. It attacks drunkards and men who lead disorderly lives; but those careful of their health can live there as well as elsewhere.

(*To be continued.*)

PHYSIOGRAPHIC NOTES.

BY

RALPH S. TARR.

PHYSICAL GEOGRAPHY OF TEXAS.—Folio 3, of the Topographic Atlas of the United States, just published, is devoted to a description and discussion of the Physical Geography of the Texas Region by Robert T. Hill. It is a publication of decided importance to all students of the new physical geography, and ought in addition to be of great value in the schools of Texas and elsewhere. After a general description of the State there is a discussion of the relief, with special reference to the relation between the surface features and the geological formations; and Mr. Hill's treatment shows that this relation is decidedly interesting. While the treatment of the mountainous sections is excellent, it is natural that in this State, so typically a region of plains, the consideration of features connected with plains is most fully treated. There is, so far as I know, no other discussion of plains so elaborate as this. The State supplies types of a great variety of plains, and these are fully described, interpreted and classified. In connection with the description Mr. Hill has found it desirable to introduce several new terms, a number of which are borrowed from the Spanish.

Following the description of mountains and plains there is a briefer discussion of the rivers, in which many of the peculiar features of the Texas drainage are interpreted. This is followed by a general treatment of the climatic features, illustrated by maps, and the text closes with a brief statement of the economic geology and the main facts concerning the distribution of population.

The paper is more than a mere contribution to local physiography. Its breadth of treatment warrants us in ranking it as one of the notable contributions to general physiography ; and its value is greatly increased by the splendid illustrations printed upon sheets at the close of the Folio. These include a number of beautiful and well-selected half-tones of some of the more typical features which are capable of illustration by photograph ; and in addition to these are many map illustrations of features which are too large to be shown by half-tones. These maps are carefully selected from the topographic sheets of the United States Geological Survey. In no case is the entire sheet included, but merely those portions which

illustrate the types. They therefore stand out as striking representations of the forms. The last illustration is a large folded contour map of the State, based to a considerable extent on Mr. Hill's own intimate knowledge of the surface features of Texas.

There is but one feature of the Folio which seems unfortunate, and that is its immense and unwieldy size. While this objection applies to all Folios of the Survey, it may be urged with greater force against this one, since it is not only unnecessary, but seriously interferes with its use in school work. The text is printed in four parallel columns on each page, making its study difficult in the extreme. Since the paper is so important a contribution, it is to be hoped that it will be found possible to publish it in book form. The larger map sections could be easily reproduced in a smaller size, making them full-page illustrations, and the map of Texas could be included as a folded map in a pocket.

THE CASCADE MOUNTAINS OF NORTHERN WASHINGTON.—The work which Professor I. C. Russell has been engaged upon during the last few years in the Cascades of northern Washington appears as a preliminary paper in the Twentieth Annual Report of the United States Geological Survey (Part II, pp. 83–210). In this paper Professor Russell makes some important contributions to the physiography of that region.

The prevailing westerly winds cause a warm, humid climate and heavy rainfall on the western side, where the snowfall is light near the sea-level, but heavy in the mountains. The fogs, clouds and rain of this western slope are in striking contrast to the sunny, arid, eastern slopes. In consequence, while the eastern Cascades are largely without trees, the western slope is clothed in a dense forest of giant trees. Professor Russell's description of this forest is the best that I have seen. He shows, too, that the difference of climate, so clearly defined at present, was also present during the Glacial Period. The existing glaciers of this part of the Cascades are, for the most part, on the rainy western side of the divide, and in the Glacial Period the glaciers on the western slope of the mountains were far more extensive and of greater thickness than those that descended the deeply-cut valleys on the east side. That this difference in climate is even more ancient than the Glacial Period is indicated by the fact that the west-flowing streams show evidence of greater maturity than the east-flowing streams. While this is due largely to differences in rainfall, it is, of course, to be explained in part by the fact that the west-flowing streams have shorter and more direct slopes to the sea.

This portion of the Cascade Mountains is a complex of wild and exceedingly rugged ranges, occupying a tract from one hundred to one hundred and twenty-five miles in width. The general elevation of these ridges is about 7,500 feet, giving the appearance of a plateau as viewed along the crests; but here and there peaks and groups of peaks rise to a still greater elevation. Among the peaks are some volcanic mountains, only one of which, however—Glacier Peak—is situated in the part of the Cascades which Russell has studied. The rocks of the mountains are metamorphic, igneous and sedimentary, varying, therefore, in power of resistance to the weather. They are, moreover, complexly folded, with the folds having north and south axes in the main, but with some folds and faults diverging at a high angle from the main trend of the Cascades. The age of the rocks varies from pre-Cretaceous to Tertiary, the older rocks being so metamorphosed that their exact geological age is unknown.

In consequence of the uniformity in elevation of the average crest of the ridges, taken in connection with the complexity of the texture and altitude, Russell concludes that

> The Cascade Mountains, as we now know them, seem to have been carved from an upraised peneplain.

His interpretation of the present form is that an older mountain system, long eroded, was ultimately reduced to the condition of a peneplain, then elevated bodily at least 7,500 feet, and later deeply dissected until the present rugged topography was evolved. To the present writer this interpretation of the topography seems to rest upon very unconvincing evidence. It is this sort of so-called peneplain against which I have protested in a recent paper. Without a more complete discussion of other explanations, there are a number of physiographers who will look with scepticism upon this hypothesis as applying to the interpretation of the rugged Cascades.

In the dissection of the Cascade Mountains there have been a number of interesting stream changes, which Russell discusses in his treatment of the river valleys. He points out that the greater part of the task of dissecting the land has been performed by running water, but that glaciers have done something to modify the contours of the valleys. These glaciers, now represented by mere remnants of a minute kind in the higher valleys, formerly flowed outward both to the east and west as true Alpine glaciers of immense size. Both the ancient and the existing glaciers are fully described in the text, and in connection with this description numerous instances are pointed out in which valleys have been modified by ice

action through scouring, deepening and filling. A number of examples of rock basins are mentioned, and an excellent half-tone illustration of one of these is presented. There is a full description of the beautiful and interesting Lake Chelan, previously described by Gannett.

As previously stated, the ancient glaciers on the western side were the most extensively developed, and the ice upon that side was so thick

that when the glacial conditions were at their maximum a general ice-sheet was formed, which buried some of the most prominent ridges.

These thick glaciers, descending to the plain at the western base of the mountains,

expanded and united at their lower extremities and assisted in forming a large piedmont glacier which occupied the Puget Sound Basin. This piedmont glacier had two stages of broad expansion, separated by an interglacial stage, during which thick gravel deposits, together with layers of peat, were spread out on top of a basement layer of till.

It is noteworthy that it was Russell who described the first existing instance of a piedmont glacier, and that he, too, has given us this clear evidence of a much larger ancient example of a similar ice-sheet. Another feature connected with glacial deposit and post-glacial erosion is the deep filling of gravel and sand, in general, several hundred feet in depth, in the valleys of northern and eastern Washington. It is the excavation of these gravels in post-glacial times that has given rise to the beautiful terraces which border these streams. Russell presents clear evidence that the formation of these terraces has been due in no sense to a tilting of the land, but merely to increased power of erosion, due to the decreasing load of sediment resulting from the disappearance of the glaciers. The paper closes with a detailed discussion of the influence of avalanches and land-slides upon the topography of this region, followed by a very brief treatment of the economic deposits.

NOTES ON ETHNOLOGY.

BY

J. WALTER FEWKES.

NOTES UPON THE ETHNOGRAPHY OF SOUTHERN MEXICO. BY FREDERICK STARR, *Proc. Davenport Academy of Natural Sciences, Davenport, Iowa, 1900.*—Government statistics, according to Prof. Starr, show that about five-twelfths of the total population of Mexico are pure Indian, and while in general the inhabitants of the Northern States are mestizos, the aboriginal blood overwhelmingly predominates from the City of Mexico southward.

During the last three years Prof. Starr has made annual expeditions to our sister republic to ascertain and define the physical types of these tribes. In the course of this work he has made measurements upon 160 men and 25 women in each tribe considered, and obtained and made photographs and plaster casts from selected representatives of each tribe.

The results of the measurements he intends to publish later, but a selection from the photographs has been printed in a beautiful Ethnographic Album of one hundred and forty-one plates, with text.

This most valuable addition to our knowledge of physical anthropology he has now supplemented by a special article, containing ethnographic data in the form of notes, which will be widely welcomed among anthropologists as a timely contribution to an attractive subject.

These notes relate to sixteen or seventeen tribes visited by the author, the location of thirteen of which is shown on a sketch map accompanying the pamphlet.

The following tribes are considered: Otomis, Tarascans, Tlaxcalans, Aztecs, Mixtecs, Triquis, Zapotecs, Mixes, Tuaves, Chontals, Cuicatecs, Chinantecs, Chochos, Mazatecs, Tepehuas, and Totonacs. The article contains many valuable notes on the customs, languages, arts, religion and folk-lore of these tribes, survivals of ancient times. Many tribes have survivals of ancient pagan ceremonials, among which may be mentioned the so-called pastores and snake dances of the Tepehuas and Totonacs. The article contains suggestions regarding the limitations of linguistic stocks, and a vocabulary of seventy-nine words in nine languages arranged in a tabular form.

Plates containing good figures of articles of dress and other objects close the notes, which are valuable aids to the study of the ethnography of Mexico.

RECENT MEXICAN STUDY OF THE NATIVE LANGUAGES OF MEXICO. BY FREDERICK STARR. *The University of Chicago Press. Department of Anthropology. Bulletin IV.*—The catalogue of writers in the native languages of America by that eminent bibliographer, Icazbalceta, gives an idea of the wealth of literature in the aboriginal languages of Mexico. The output in this direction has not lessened since this valuable work was published, and Prof. Starr now calls attention to more recent literature in the same field. He disarms criticism by laying no claim to completeness, and does not include articles printed in Maya, of which there are many additional, nor those before learned societies printed independently. Prof. Starr has rendered an important service to science by calling attention to the activity of many native students of Mexican languages, whose names and works ought to be better known to our anthropologists.

DER URSPRUNG UND DIE WANDERUNGEN DER VÖLKER GEOGRAPHISCH BETRACHTET: II. GEOGRAPHISCHE PRÜFUNG DER THATSACHEN ÜBER DEN URSPRUNG DER VÖLKER EUROPAS, VON FR. RATZEL. *Königl. Sächs. Gesellschaft der Wissenschaften zu Leipzig.* Feb. 3. 1900. — The well-known Anthropogeographer, Prof. Fr. Ratzel, devotes an article to the origin and migrations of the European races in their relation to geographical conditions and changes—a most instructive subject, treated in an interesting way by a master.

Europe is a particularly good continent for the determination and verification of the laws of the influence of geographical conditions on the prehistoric and historic development of man. The human race has inhabited this land from a remote antiquity, reaching into a geological epoch antedating our own, and there is a large fund of archæological data to bring to the aid of a discussion of the problem. No less zeal has been shown, with unparalleled results, in the study of European geology and geography, and with all this wealth of material at his control the physical geographer is well equipped to consider properly the influence of environment on man, past and present. Prof. Ratzel has shown great skill in handling this material, and his work is a suggestive contribution to science.

The advent of prehistoric man in Europe antedates the Quaternary Epoch, which period is a natural beginning of the study of European man. Far-reaching in their influences have been the climatic changes since this land has been a habitation of the human race. Man lived

in Europe when a great sheet of ice covered its whole northern part—when France, Spain and Italy were practically islands, or one large island, and Greece was connected by land across the Ægean Sea with Asia Minor. The habitable regions of Europe at that epoch were contiguous to Southwestern Asia, and the great glacier and inland waters formed by an enlargement of what are now the Caspian and Black Seas made all northern parts uninhabitable by the human race. Whatever influx of peoples there were from Asia at that time must have been along the only available route, or through Asia Minor, following the northern shores of the Mediterranean Sea. The climatic condition of Southern Europe at the Quaternary Epoch, the distribution of forests, tundras, steppes, and rivers, exerted a profound influence on this early man. Animals now extinct were hunted for food, and different forms of food plants no doubt existed.

The people of ancient Europe were not racially different from some of the races still found there, for the skull of the Stone Age man is anthropometrically the same as that found in certain parts of modern Europe. According to Ratzel there has always been the same race in Europe since the neolithic period. His consideration of the probable cultural condition of this early European is important; but even more instructive are his studies of the subsequent migrations of races and the distribution of races in post-glacial times. Various aspects of the influence of changes of climate and other geographical conditions on man are considered in a suggestive way. Ratzel concludes that the Sahara was once well watered, especially in its northern part, and was more densely populated. The former distribution of steppes in Europe has exerted a most important influence on the distribution of culture, for these treeless, grassy plains turn man to pastoral or nomadic life, and their distribution has exerted a profound influence on the migration of man in all lands.

In his introduction of the influence of the glacial epoch on the early distribution of man in Europe and the peopling of the northern parts, Ratzel deals with a most potent factor in European racial ethnography. This is not a new theme; and while glaciation may have obliterated traces of human habitation in the land over which the ice was spread, the fact remains that this epoch greatly modified climatic conditions in the South of Europe and Northern Africa. We cannot in discussing prehistoric man in Europe neglect preglacial man on the ground that the population of that time was too remote to be considered, as some writers advise; for the origin of

European man is intimately connected with climatic changes, and must be considered as a geographical question.

Carl Ritter, the founder of Physical Geography, in the infancy of Anthropology called Asia the land of the childhood, Greece of the youth, and Europe of the maturity of the human race. The great accumulation of archæological material since his day tends to modify this statement, especially regarding the relative antiquity of cultural areas of Europe. The highest development of stone-working man was in the North and Northwestern parts of Europe, in the Northern Alps, along the Danube, and in Southern Russia. An indigenous culture arose in France at the close of the Stone Age, and another, with Oriental affinities akin to the Etruscan, in the highlands of the Eastern Alps. This latter, or Hallstatt culture, was probably as high, if not higher—as old, if not more ancient—than that of Greece.

At the dawn of history there were numbered among the Mediterranean race the Iberians, Sikelians, and Ligurians of classical writers, inhabiting what are now called the Iberian and Italian peninsulas. Greece, Asia Minor and Syria were occupied by Proto-Armenians or Alarotic people, with Hamitic races at the extreme south of the last mentioned. The Ligurians lived along the coast of the Mediterranean—in Italy, France, Spain, and the neighboring islands; the Iberians inhabited the coast from the Pyrenees to the Rhone.

Among early European races the Etruscans deserve special mention, but their origin has led to much speculation. Ratzel seems to ally himself with that school which regards them as of Lydian origin, which conclusion readily harmonizes with available geographical data. The resemblances between the early Alpine and Hallstatt civilizations would be readily explained on this theory by former connection, and, later, separation by a Keltic people which had moved in between them. Sergi's theory that the Etruscan culture was composed of two ethnic elements—one Danubian, the other Mediterranean in origin—has much to recommend it.

The relation of the Mediterranean races to those of the Orient, as shown in the distribution of bronze and iron, is considered from both archæological and historical points of view. Evidences are adduced to show that these metals passed from Southwestern Asia to Southeastern Europe, and were disseminated northward and westward. Bronze entered Europe by two great pathways—one maritime by the Mediterranean, the other through trade or in the hands of colonists along the Danube.

Naturally the much-debated question of Aryan origin occupies a prominent place in Ratzel's discussion of European origins, and he considers it impossible to ascribe to the Aryans any characteristic culture. He finds, however, a parallelism in the distribution of the Aryans in Europe, and that of the two metals, bronze and iron, over the same continent. There is an important truth in Ratzel's statement that the question of race and that of culture are distinct, and the same holds also regarding language and culture. It is evident, as more and more facts are accumulated by anthropologists, that there never was a distinctively Aryan race swarming into Europe from Asia or Africa, as some would have us believe, but that the Aryan question is simply one of language. Have the resemblances in the linguistic roots of the so-called Aryans been derived from Asia or Africa, or have the similarities arisen independently? There is no distinct Aryan race, an Aryan culture is doubted by many, and the resemblances in languages, which have served as the basis of so much speculation, do not necessarily mean derivation, but may have resulted from the integration or composition of tribal languages, as pointed out by Major Powell.

It is impossible to do justice to Ratzel's main argument in a brief notice, and on that account the reader is advised to study in detail this important contribution to anthropogeography. It is accompanied by a map, following Deniker's interpretation, illustrating the geographical condition of Europe in the Quaternary Epoch, with lines indicating the supposed distribution of early races.

NOTES ON CLIMATOLOGY.

BY

ROBERT DEC. WARD.

THE GEOGRAPHICAL DISTRIBUTION OF RELATIVE HUMIDITY.—At the Bradford meeting of the British Association (1900) an important paper on *The Geographical Distribution of Relative Humidity* was presented by E. G. Ravenstein. In view of the fact that the observations of relative humidity as at present carried out at many meteorological stations and on board ship are not very reliable, the author has limited himself to indicating four grades of mean annual humidity, the upper limits of which are respectively 50 per cent. (very dry), 65 per cent., 80 per cent., and 100 per cent. (very damp). The relative humidity over the oceans may exceed 80 per cent., but in certain regions, such as the "horse latitudes," it is much less. Over a portion of the South Pacific it does not exceed 65 per cent. The salinity of the same portion of that ocean is greater than over neighboring regions. Another chart shows the Annual Range of Humidity, *i. e*, the difference between the driest and dampest months of the year. In Great Britain, as in many other parts of the world where the tempering influence of the ocean is marked, the range does not exceed 16 per cent. In the interior of the continents, however, it occasionally exceeds 45 per cent., the spring and summer being exceedingly dry, while the winter is very damp. Thus, at Yarkand, the relative humidity in May is 30 per cent., while it is 84 per cent. in December. By combining temperature and humidity the author divides the earth's surface into sixteen so-called *hygro-thermal* types, which are as follows:

1. Hot (temperature 73° and over) and very damp (humidity 81 per cent. or more)—Batavia, Camaroons, Mombasa.

2. Hot and moderately damp (66–80 per cent.)—Havana, Calcutta.

3. Hot and dry (51–65 per cent.)—Bagdad, Lahore, Khartum.

4. Hot and very dry (50 per cent. or less)—Disa, Wadi Halfa, Kuka.

5. Warm (temperature 58°–72°) and very damp—Walfisch Bay, Arica.

6. Warm and moderately damp—Lisbon, Rome, Damascus, Tokyo, New Orleans.

7. Warm and dry—Cairo, Algiers, Kimberley.

8. Warm and very dry—Mexico, Teheran.

9. Cool (temperature 33°–57°) and very damp—Greenwich, Cochabamba.

10. Cool and moderately damp—Vienna, Melbourne, Toronto, Chicago.

11. Cool and dry—Tashkent, Simla, Cheyenne.

12. Cool and very dry—Yarkand, Denver.

13. Cold (temperature 32° or less) and very damp—Ben Nevis, Sagastyr, Godthaab.

14. Cold and moderately damp—Tomsk, Pike's Peak, Polaris House.

15. Cold and dry—

16. Cold and very dry—Pamir.

FAMINES IN INDIA.—The recent Indian famine, with its appalling loss of life, has naturally led to considerable discussion of questions concerning the causes of these famines, the relief of the poor during such crises, and the possible prevention of famines in the future. One of the most interesting publications which has appeared in this connection is a book entitled *Open Letters to Lord Curzon on Famines and Land Assessments in India*, by Romesh C. Dutt, Lecturer on Indian History at University College, London. While this volume is largely political in its nature, it contains a number of noteworthy facts concerning past famines, their causes, and the loss of life due to them. During a period of 130 years of British rule in India there have been twenty-two famines. The first great famine which attracted the attention of the British nation to this subject was the Bengal famine of 1770, which, like all famines there, was immediately caused by the failure of the monsoon rains, although the intensity of the famine and the great loss of life it caused were partly due to the maladministration of the East India Company, and the consequent impoverishment of the people. It is estimated that over ten millions of people died of this famine. Succeeding famines occurred in 1783, 1784, 1792, 1803, 1804, 1807, 1813, 1823, 1833, 1837, 1854. In 1833, 200,000 persons died in Gantur out of a population of 500,000. In 1837, after a failure of the rains, about 800,000 people died in Northern India of famine. The wars of the Indian Mutiny greatly interfered with cultivation, and a failure of the rains in 1860 was followed by a famine in which about 200,000 people died. The Orissa famine of 1866 resulted in the death of nearly 1,000,000 persons; while the

famine of 1869, in Northern India, gave a mortality estimated at 1,200,000. The Madras famine of 1877 caused a loss of life estimated at 5,000,000. The intensity of this famine decreased markedly when the rains commenced. In 1897 a famine visited Northern India, Bengal, Burma, Madras, and Bombay which was more widespread and more intense than any that had occurred up to that time. No reliable figures, it is stated, are yet obtainable as to the loss of life during the present famine. Within the last forty years there have been ten famines in India, and at a moderate computation the loss of life from starvation and from disease brought on by them may be placed at 15,000,000. The immediate cause of famines in India is, in almost every instance, the failure of the rains. This cause must continue to operate, until, as Mr. Dutt says, there is in India a more extensive system of irrigation than has yet been provided. The author goes on to say:

> But the intensity and the frequency of recent famines are greatly due to the resourceless condition and the chronic poverty of the cultivators, caused by the over-assessment of the soil, on which they depend for their living . . . Land revenue is the most important item of the Indian revenues, and so it happens that the taxation falls heavily on the cultivators of the soil, and reduces them to a condition of chronic poverty. They can save nothing in years of good harvest, and consequently every year of drought is a year of famine.

Mr. Dutt points out that in the famines of 1877, 1897, and 1899 the parts of India which were over-assessed suffered most severely. The author's study leads him to the following conclusion:

> There is no doubt these famines are directly caused by the failure of the annual rains, over which man has no control; but it is equally certain that their intensity and their disastrous effects can be to a great extent mitigated by moderating the land tax, by the construction of irrigation works, and by the reduction of the public debt and the expenditure of India.

This condition of things in India furnishes an interesting illustration of the close relations that may exist between man, the climate in which he lives, and the laws by which he is governed.

Climatic Control in the Desert.—A recent article on *Climatic Control in the Desert*, by Mary I. Platt (*Journal of School Geography*, Sept. and Oct., 1900), is very suggestive along the line of human climatology. Miss Platt classifies deserts as *arid* and *ice* deserts, and under each of these heads she considers some of the ways in which the climate of the desert has influenced man. The Sahara is taken as the type of the arid and Greenland as the type of the ice desert. The wonderful adaptation of plant and animal life to the hard conditions in which it finds itself in the arid or ice desert

are clearly, though briefly, sketched. Schirmer's classification of the Saharan tribes into Nomads and Sedentaries is adopted. The Nomads camp near towns in winter, and wander with their flocks and herds in summer in search of water and pasturage, while the Sedentaries live throughout the year in towns near oases or near mountains on the edge of the desert. The food, occupations, and commerce in the Sahara are briefly discussed, and the characteristics of the people are shown to be closely affected by the conditions of life imposed upon them by the climate. Miss Platt draws some interesting parallels between the desert of sand and the desert of ice:

> Between the sand desert and the ice desert there are marked similarities and some contrasts. In the ice desert, all the people live on the edge. In the sand desert, nearly all the people live on the edge, near the border mountains or on the edge of the interior mountains. Nearly all the men of Sahara are nomadic, and the Eskimos are also, to a less degree. In Greenland the great enemy is the cold; in Sahara the great enemy is the sand. In Greenland the one great dependence of the natives is the seal, which supplies them with food, clothing, habitation and fuel; in Sahara the one chief source of maintenance is the date palm, which supplies food and wine, fibres for mats, wood for houses. Greenland is a white, desolate waste; Sahara is a gray, desolate waste . . . In both places water is very scarce and has to be carefully treasured; in both places wood also is very scarce and has to be most frugally used. In the one case there is monotonous cold; in the other, monotonous heat. In Greenland the sun is welcomed back after the long night; in Sahara the sun shines with a fierce, relentless glare, and the people hide from it by day, and travel largely by night . . . The people of the north are stolid, easily controlled, and low in physical and mental development. Conditions are too hard, and they have succumbed to them, only existing, not living. The people of the Sahara are alert, active, intelligent and enduring. They have a fighting chance, and so they fight to live, and in the contest are made strong.

GEOGRAPHICAL RECORD.

AMERICA.

THE NEW YORK HARBOUR IMPROVEMENT.—The work of deepening and widening the entrance to New York Harbour from the Narrows to deep water will be begun at once. The thirty-foot waterway now in use has a winding course through the channels known as Main Ship, Bayside, and Gedney. This passage is tedious, and the danger of collision is considerable. The East Channel is now to be deepened to forty feet and widened to 2,000 feet, and when the improvement is completed all vessels may hold their way in a nearly straight line from the sea to the Narrows, whence there is clear sailing to the wharves on both sides of the North River. The improvement will be completed in five years or less, and then the entrance to New York harbour will be unsurpassed by that of any other port.

Work is also about to begin on the deepening of the Bay Ridge and Red Hook channels from the inner end of East Channel, along the water-front of Brooklyn, to Buttermilk Channel. These channels are to be deepened to forty feet at low tide and widened to 1,200 feet, which will permit the development of dockage facilities along several miles of the Brooklyn water-front not now utilized. These improvements have been duly authorized by Congress. The proposed improvement of Buttermilk Channel is now before the House of Representatives. When all these improvements are carried out the East River fronts of Manhattan and Brooklyn Boroughs will have quick and safe communication with deep water and the commercial facilities of the port will be greatly increased.

ANTHRACITE IN THE UNITED STATES.—Practically all the anthracite of the United States is mined in an area covering only 480 square miles in northeastern Pennsylvania. It is mined mainly along the banks and in the valleys of three rivers: along and near the Susquehanna, with the largest centres of the industry at Scranton and Wilkesbarre; along and near the Lehigh, with the region around Mauch Chunk as the most prominent field; and along the Schuylkill, with Pottsville as the chief shipping point. It was a Pottsville furnace, in 1839, that won the prize of $5,000 offered by Philadelphians for the first successful smelting of iron ore with the use of anthracite. The fact that the Lehigh and Schuylkill lead to the Delaware and Philadelphia gave that city a great impetus in manu-

facturing in the days before railroads supplanted water carriage for anthracite. Even though a great strike, such as that which has recently terminated in the anthracite region, should be long continued, the resulting dearth of this fuel would have no appreciable effect upon iron production, because, though a little anthracite is still used for ore smelting, it has been almost wholly supplanted by bituminous coal.

EMIGRATION TO ARGENTINA.—According to the London *Times*, the Argentine Government has granted a large concession of land in its northeastern province, Formosa, in the Gran Chaco, and 20,000 Japanese farmers are to be settled in the eastern part of the province. This eastern portion of Formosa, near the Paraguay River, is the only part of it that is yet cultivated. It is rich in soil, forests, and waterways, and yields abundant crops of maize, tobacco, and sugar cane.

EUROPE.

SPAIN AND THE GREENWICH MERIDIAN.—A decree by the Spanish Government declares that after Jan. 1, 1901, time throughout Spain and the Balearic Islands, in all the public offices and courts, and in the railroad, telegraph, mail and steamship services shall be regulated by the time of the Greenwich Observatory. The railroad and the telegraph offices in Spain have heretofore used Madrid time, and the official time throughout Spain has been determined by the meridian of each locality. The substitution of Greenwich time will be a convenience not only to the Spanish nation but to all other countries in which the telegraph is used in business relations with Spain.

The official time in Portugal is that of the Royal Observatory, which is nearly thirty-seven minutes slower than Greenwich time. France and Portugal are now the only countries of western Europe that still maintain their own time standards.

IRRIGATION IN SPAIN.—The Government of Spain decided, in May last, to construct reservoirs and irrigation canals for enlarging the agricultural area. The country has therefore been divided into seven irrigation districts, and preparatory work has begun. The most of Spain receives less precipitation than any other part of Europe excepting the centre of the Kola peninsula, on the north coast of Russia, and the southeast coast of Russia around Astrakhan. The mountain system of Portugal and Spain, not far from the Atlantic border, prevents the moisture-laden west winds from carrying their burden of rain to the inland districts; thus, while there is

enormous rainfall among the Cantabrian mountains in the north and ample precipitation in quite a large part of western Spain, the great central plateau and the western Mediterranean coast have an inadequate supply. Many of the rivers have cut very deep channels, and it is likely that the cost of raising the water from some of them would exceed the advantages to be gained. The Government estimates, however, that in the valley of the Ebro river alone 336,000 acres may be reclaimed. The irrigated lands in the valleys of the Ebro and Tagus are yielding twelve times as much fruit as the dry lands.

THE PALUTNOTCHNIE CANAL.—A telegram from Odessa, on Oct. 5, reported that the Russians had completed the Palutnotchnie Canal at the mouth of the Kilia, or northern branch of the Danube delta. More than sixty-three per cent. of the Danube waters have reached the Black Sea through the Kilia, but an extensive bar at the mouth of the stream has prevented that branch from being available for navigation except by small vessels. The St. George, or southern branch of the delta streams, has no commercial importance, and only the Sulina or middle branch, receiving but eight per cent. of the Danube, has afforded a passage for commerce to and from the Black Sea. By the improvement now made at the Kilia mouth, Russia has opened another important waterway for the Danube trade. Heretofore, Russian vessels on the Sulina have had to pass through Roumanian territory; but on the more northern route now opened they will skirt the southern border of the Russian province of Bessarabia for a long distance. It is expected that the new route will give considerable impetus to Russia's trade with the Balkan States.

MAPS SHOWING NATIONAL PROGRESS.—A number of German map houses have recently given much attention to the production of maps showing the empire's present development in respect of industries, colonial expansion, sea power, merchant marine, and so on. The aim is to present graphically the resources of the empire and its achievements and tendencies in the world of work. The fine map by Prof. Paul Langhans, published in *Petermanns Mitteilungen*, in May last, is a good example of these productions. The purpose of the map is to show the sea industries of the German coasts. Most of the information is conveyed by symbols. The number of regular steamship lines, vessels and docks, the amount of tonnage of each port, the total sea trade of each port for 1898, the shipbuilding centres and number of dry docks, the fishing ports,

the towns where fish-curing is carried on, the chief fish markets, the routes by which fish are taken to Berlin, the distribution of the fisheries along the coasts, the distribution of coast population, and other information are shown with perfect legibility. The map gives an admirable bird's-eye view of all the industrial relations of the German coasts to the sea.

AFRICA.

MR. MOORE'S EXPEDITION TO LAKE TANGANYIKA.—Mr. J. E. S. Moore, whose party recently returned from Lake Tanganyika, read an account of his work before the Royal Geographical Society on November 26. The most important part of his paper related to the evidence he collected, that none of the great lakes of Central Africa, except Tanganyika, shows any sign of having formerly been connected with the sea. He found that Lake Nyassa has entirely the character of a typical fresh-water lake. It shows no trace of the prawns, the jelly-fishes, or the halolimnic mollusca (pertaining both to salt and fresh water) that are found in Tanganyika. While Nyassa lies in the southern extension of the same series of faulted valleys that also contain Tanganyika, the valleys of these lakes are not continuous. He found no vestige of any of the halolimnic animals in any of the lakes in the Rift valley north or south of Tanganyika, but this fauna did appear to extend into the Congo valley. It was only necessary for this extension to cover some eighty miles to bring it into communication with the great circular basin of the Congo itself. Much of this basin was formerly covered by the sea, and he was, therefore, strongly inclined to believe that the connection which the lake once had with the sea, and which resulted in the introduction of sea animals into Tanganyika, was on the west or Congo side of the lake.

THE DESICCATION OF LAKE NGAMI.—The desiccation of Lake Ngami, in South Africa, has made very rapid progress in the past ten or twelve years. When Livingstone reached the lake in 1849 he found it covering an area of about 300 square miles. The lake has now entirely disappeared. Its place is wholly occupied by a somewhat marshy plain covered with reeds, and no vestige of water surface is to be seen. The Taoge affluent has entirely dried up for about twenty miles from the lake, and above that point it is gradually disappearing. The inhabitants have abandoned their numerous villages around the lake, and only a few cattle-raising tribes remain.—(*Geographische Zeitschrift*, 1900, p. 343.)

ASIA.

THE DESICCATION OF THE PAMIR LAKES.—Lieut. O. Olufsen, of Denmark, has continued the researches which he began in the Pamirs in 1896. The first object of his latest expedition was to study the Yechil Kul, a lake in the eastern Pamirs, which is now much smaller than formerly. He hoped by means of precise hydrographic measurements to get an idea of the progressive diminution of this lake and of others in the neighborhood which, at one time, were a part of it. The desiccation of these lakes is one of the phases of the marked climatic changes in that region. The quantity of water formerly available for irrigation in Turkestan and Bukhara has diminished, and a number of oases once cultivated have been abandoned. This phenomenon has been caused by the diminution of the glaciers on the Pamirs which feed the Syr Daria and the Amu Daria, almost the only sources of life in those regions. The quantity of water derived from Pamir snows seems to have long been diminishing, not because less snow falls but on account of the erosion which is lowering the ridges and filling up the valleys. Thus the wind has greater sweep, and the snow is blown away as it is in vast expanses of Tibet. One of the affluents of the Amu Daria passes through the Yechil Kul, and the gradual drying up of that lake shows how the ancient Oxus is being deprived of an important source of water. The lake is now only thirty-seven miles in circumference, and its greatest depth is about 130 feet. There are five other lakes in the neighborhood, all of which are salt and surrounded by salt fields, though formerly they were fresh and were a part of the Yechil Kul, which at that time had a circumference of at least 125 miles.—(*Verhandlungen* of the Berlin Geographical Society, 1900, Nos. 2 and 3).

MISCELLANEOUS.

THE POPULATION OF HAWAII.—A census *Bulletin*, issued in November, shows the population of Hawaii on June 1, 1900, to have been 154,000—a growth of 41.2 per cent. over 1896, when the inhabitants numbered 109,020. Of the seven important islands, Oahu has the largest population, and about two-fifths of its 58,504 inhabitants live in Honolulu. Hawaii island has 46,843 inhabitants, the large expansion of the sugar industry having drawn many immigrants there since 1890. Maui, whose industries have been revolutionized by irrigation and its tillable lands practically all taken up, stands third with 25,416. Kauai, which has some very productive sugar and rice plantations and good grazing lands but almost no native population, comes next with 20,562. Molokai, on whose north shore the two

leper settlements are situated, and little Lanai, south of it, have together 2,504 inhabitants, and are the only islands that have decreased in population since 1896. Niihau, the most western island of the group, is practically owned by one white man, and its population is only 172. The percentage of increase in the entire group in the past ten years is 71.1. In other words, the population has increased over seven-tenths in the past decade. The great development of cane sugar-growing has been the largest material factor in promoting this rapid increase in population. The islands are the third largest producer of this commodity in the world. About 300,000 tons of raw sugar are produced every year, and nearly all the money invested in agriculture goes into sugar-planting.

Falcon Island Reappears.—*La Géographie* (Oct., 1900) says a letter has been received from Mr. Vossion, the Consul General of France in the Tonga group, announcing that Commandant Ravenhill of the cruiser *Porpoise* reports the re-emergence of Falcon island, which is now about ten feet above sea-level. In April, 1899, it was reported that after a brief life of fourteen years Falcon island had ceased to exist. The island was formed by a great volcanic eruption at the bottom of the Pacific in 1885. It appeared above the surface about thirty-five miles from the island of Tofoa, in the Tonga group. A submarine volcano had reared, from the bottom of the ocean, a great mass of ejecta, and the outpourings rose above the water. The island consisted of two distinct parts. One of them was a hill of gentle slope and wide base, whose height was 153 feet. The other part was a flat extending away from the base of the hill and only ten to twelve feet above the high-tide level. The island was merely a bare, brown heap of ashes, destitute of vegetation save for a half-dozen seedling plants. Great rollers from the sea swept up the black shores, and Mr. J. J. Lister, who visited the island a few years before it disappeared, reported that it was rapidly being torn to pieces by the waves. It finally disappeared last year, and its reappearance now is doubtless due to another volcanic eruption.

The Gulf Stream Myth.—The September number of the *Monthly Weather Review* has an interesting article with the above title, which says that

> by itself alone the Gulf Stream has as much effect on the climate of northwestern Europe as the fly in the fable had in carrying the stage coach up the hill.

It adds that the mild climate of northwestern Europe is due, not to the Gulf Stream, but to the prevailing eastward and northeast-

ward drift of the air currents, which distribute the heat conserved by the whole of the Atlantic Ocean north of lat. 35°.

The article is a refutation of the old story that the Gulf Stream, with its genial warmth, makes Norway habitable, keeps the harbour of Hammerfest north of the Arctic Circle free from ice, and gives an agreeable climate to the whole of northwestern Europe.

It may be added that about ten years ago the *Proceedings* of the Royal Geographical Society said it would

> probably take a generation or two to eradicate the old erroneous notions of text-books and popular treatises concerning the Gulf Stream.

From the time of the *Challenger* soundings to the present all evidence collected by such experienced hydrographers as Carpenter, Buchanan, Findlay, Thoulet, Agassiz, and others, shows that the Gulf Stream, as such, ceases to exist somewhere east of Newfoundland.

POLAR REGIONS.

LETTERS FROM PEARY.—Mr. Herbert L. Bridgman, secretary of the Peary Arctic Club, printed in the Brooklyn *Standard Union* of November 26 the following extracts of letters from the explorer, communicated by the family of Mrs. Peary in Washington.

These letters from Peary were carried by natives to the camp of the Stein party at Cape Sabine, Ellesmere Land, and were taken to Cape York by Dr. Kann, who left Greenland on the 9th of June, in the steamer *Eclipse*, and landed at Dundee, Scotland, November 9.

FORT CONGER, LADY FRANKLIN BAY,
March 31, 1900.

Just a line to go down to a whaler by returning natives. I arrived here at midnight of the 28th, twenty-four days from Etah. Six and one-half days of this time we were held in camp by heavy windstorms. The doctor and Henson each left Etah with natives before we arrived here. The journey was a tedious one, owing to the storms, but not an uncomfortable one for me. A number of the dogs died on the way, but I had an ample number for the work ahead. Twenty-one musk oxen were killed in sight of the fort the day before I arrived, so we have an abundant supply of fresh meat.

After resting and feeding the dogs a few days longer I shall go on with Mott and the best Eskimos up the northwest Greenland coast. The Doctor and the other Eskimos will remain at the fort, hunting. I am in good condition, and the journey shows me that I am myself again. If I do my work this spring I shall come back and hasten down to meet the ship, and turn back with her. I hope to write again by natives whom I shall send back from some point up the Greenland coast. Dr. Dedrick wishes to be remembered.

CAPE D'URVILLE, GRINNELL LAND.

I write this note on the chance of Stein and Dr. Kann reaching Upernavik by way of Melville Bay. The fall and winter passed comfortably at Etah, without even a day's indisposition on my part. I have husbanded myself carefully. My feet have given me very little trouble, and now I feel that I am myself again. I am now at the *Windward's* winter quarters, with the rear division. Mott and the doctor are ahead, with two other divisions, all on the way to Conger. All but a few of the natives will return at once from there, leaving a few with me. I shall push on from Conger without delay, perhaps by way of the Greenland coast. I shall strain every nerve, and, God willing, shall do my work this spring, that I may come back this summer. I send duplicate of this to Cape York for a whaler.

(Dated March 12, 1900.)

This is the first direct information received from Peary since August 28, 1898, and it is most encouraging evidence of his unabated resolution, activity, and energy. He and his companions were in perfect health, and they had abundant supplies for the task before them. There is every reason to believe that this task will have been accomplished in the early summer of 1901, and that Peary will join his wife and child at Etah, to return with them in the *Windward*.

THE STEIN EXPEDITION TO ELLESMERE LAND. — Dr. Robert Stein, with two companions (Dr. Leopold Kann and Samuel Warmbath), landed at Cape Sabine, Ellesmere Land, August 5, 1899, to carry out a plan for the exploration of that region, formed by Dr. Stein. Dr. Kann, in June of this year, took passage on the Scotch whaler *Eclipse*, at Cape York, and landed at Dundee, November 9. He brings a report of the experiences of the party in Ellesmere Land.

Their first care, after setting up their tent, was to build a house for the winter—a labour of three tedious months, during which they suffered with the cold. The house was named Fort Magnesia. It stood in a corner sheltered from the north and northwest winds, and contained two rooms—a store chamber and a living room. In the latter the cooking was done. The party enjoyed excellent health all winter. Before reaching Cape Sabine, Dr. Stein secured a sledge and ten Eskimo dogs, which were kept alive for months, though it was difficult to obtain sufficient food for them.

The period of total darkness lasted 123 days at Fort Magnesia. During this time it was impracticable to explore at any distance from the base of operations; but a number of astronomical observations were made, and bears, foxes, hares, and other game were caught. Mr. Warmbath was an active hunter, and he secured many speci-

mens of the fauna, though there were practically no birds, other than a few gulls.

Late in the winter Fort Magnesia received three visits from members of the Peary party, Peary himself coming on March 6. It became clear to Dr. Stein that Peary would not be returning to the United States in the summer of 1900, and that there was no certainty of conveyance homeward for his own party. He had provisions to last a year, but not more, and it became necessary to utilize the next few weeks and the remaining stores in getting a little nearer to civilization, instead of pursuing the exploration for which the camp at Fort Magnesia was founded.

Dr. Stein had already made sledge journeys to the westward, and found evidences that Sverdrup had tried to locate the western and northwestern boundaries of Ellesmere Land. Dr. Stein has learned that large herds of musk oxen exist in Ellesmere Land, and remains of Eskimo houses, over a hundred years old, have been found. Dr. Kann declares that he and Dr. Stein made a number of valuable discoveries, but he gives no details.

Dr. Kann was under obligation to return to Austria in the autumn. In the middle of March he started with an Eskimo guide for the Greenland coast, and was followed in April by Dr. Stein. In June they reached Cape York, and there met the *Eclipse*. Dr. Kann went on board the whaler, but Dr. Stein made his way back to Fort Magnesia, with the purpose of continuing the exploration of Ellesmere Land.

Dr. Kann reports that Capt. Sverdrup's party wintered on Cocked Hat Island, northwest of Cape Sabine.

THE BROOKLYN STANDARD UNION, of December 8, announces that the personal effects of the members of the Lady Franklin Bay Expedition, recovered at Fort Conger by Mr. Peary in May, 1899, have been distributed by the Peary Arctic Club to Gen. Greely, Hospital Steward Biederbick, and Sergeant Francis Long, survivors of the expedition, and to the representatives of the many deceased members.

The Beaumont sextant, recovered at the same time, and returned to the Lords of the Admiralty in April last, has been deposited in the Museum of the Royal Naval College at Greenwich.

THE MARCH TO THE NORTH BY CAPT. CAGNI.—The *Bollettino* of the Italian Geographical Society publishes (Serie IV, Vol. 1, No. 10) the account of the sledge journey, in March and April, when the

highest north was reached by the expedition under the Duke of the Abruzzi.

The definitive start was made on the 11th of March, in very bad weather, with the thermometer at −50° Cent. (58° below zero, Fahr.) and the ice hard and rough in places, and sometimes covered with heavy snow.

On the 21st, Capt. Cagni sent back Lieut. Querini, the guide Felice Ollier, and the machinist Alfred Stoekken. Nothing has since been heard of these three men.

On the 31st of March a second party, composed of Dr. Cavalli, the guide Savoye, and midshipman Cardenti, was sent back to the camp, and reached it in twenty days.

Capt. Cagni continued his journey with the two Alpine guides, Petigax and Fenouillet, and Canepa, a seaman. They had six sledges and sixty dogs, and food for two months; but the supplies began to give out, and the dogs died or had to be killed. At 85° N. the ice became easier, and at last they reached Nansen's furthest north—86 degrees 14 minutes. After a careful observation to make sure of this they passed beyond, and on April 26, 1900, they touched 86 degrees 33 minutes N., at about 56 degrees E. Long., when it was decided to turn back. They reached the camp on the 23d of June with two sledges and seven dogs.

A TELEGRAM FROM CHRISTIANIA, of November 27, announces that the Duke of the Abruzzi has completed his arrangements for the relief expedition next spring to Franz Josef Land in search of the Norwegian machinist Stoekken, and the two Italians, who were lost during the recent expedition.

The search party will be commanded by Captain Stoekken, father of the machinist, who has conferred with the Duke of the Abruzzi and Dr. Nansen.

BARON TOLL'S expedition, it is reported, is wintering in the Kara Sea, and will send a party in the spring to the Taimyr Peninsula, where it will establish a station for scientific observations.

THE GERMAN AND BRITISH expeditions to the Antarctic will cooperate in every way. The start is to be made in August, 1901, and the plan divides the Antarctic regions into four quadrants:

The Victoria, which includes Victoria Land, and extends from 90° to 180° East;

The Ross quadrant, from 180° to 90° West;

The Weddell quadrant, from 90° West to 0° (Greenwich meridian), the Weddell Sea;

The Enderby quadrant, from 0° to 90° East. This includes Enderby Land.

The British expedition will devote itself to the Victoria and the Ross quadrants, and the German will explore the Weddell and the Enderby.

The German plan contemplates a stay of three years, and the British, it is hoped, will be able to raise the funds needed to perform equal service.

DR. NORDENSKIÖLD has bought for his South Polar expedition the *Antarctic*, the vessel used by Lieut. Amdrup in his successful East Greenland voyage.

THE NORTHWESTERN BOUNDARY BETWEEN THE UNITED STATES AND CANADA.

BY

RICHARD U. GOODE.

During the progress of the survey by the U. S. Geological Survey of a portion of the boundary line between Idaho and Montana it became necessary to identify a point on the boundary between the United States and Canada, so as to locate properly the terminal point of the line under survey. The nearest international boundary monument that existed was the Mooyie Trail monument, which was about 8½ miles west of the point of intersection. Previously, in the survey of the boundary line between Idaho and Washington, no direct connection with any monument marking the international boundary was attempted, as the nearest points marked were one near the Columbia River, about 13 miles west, and one near the Kootenai River, about 20 miles east. Similarly, in extending a guide meridian north from the 13th Standard Parallel in Idaho, there was no international boundary monument sufficiently near to permit of a connection being made. Thus, in the above-mentioned localities and many others, it is impossible to locate the line which separates the domain of the United States from that of Canada. In view of these conditions, and, further, that recently there has arisen a controversy in regard to the location of valuable mines in the Mount Baker mining district in western Washington—certain parties claiming that the mines are in the United States and others maintaining that they are in Canada—it seems appropriate to present a brief summary of the facts relating to the survey of our northwestern boundary.

The northern boundary, generally, has been the subject of much discussion and dissension between the representatives of the two countries interested. There have been recognized in the various treaties three distinct portions of this boundary, and many commissions have been organized from time to time for the survey and marking of the line.

The northeastern boundary, extending from the eastern coast of Maine to the Lake of the Woods, was agreed upon by the treaty of peace concluded at Ghent, December 24, 1814, and was eventually surveyed and marked in a satisfactory manner.

The portion of the boundary between the northwest point of the Lake of the Woods and the summit of the Rocky Mountains, along the 49th Parallel, was the subject of the second article of the convention between the United States and Great Britain held October 20, 1818. This was surveyed by the Northern Boundary Commission in 1872 to 1876 and marked in a substantial manner, 388 monuments having been established in a distance of about 861 miles (7½ miles from the northwest point of the Lake of the Woods south to the 49th Parallel and 853⅓ miles west along the 49th Parallel to the summit of the Rocky Mountains).

The portion of the boundary west of the summit of the Rocky Mountains is usually referred to as the Northwestern Boundary. It includes a land portion extending along the 49th Parallel to the sea coast at Point Roberts and a water portion extending through the waters of Georgia, Haro and Juan de Fuca Straits to the Pacific Ocean. The definition of the water part of the boundary line was agreed upon in a treaty proclaimed August 5, 1846, but it was not until ten years afterwards that Congress made provision for a commission on the part of the United States to unite with a similar commission on the part of Great Britain to survey the northwestern boundary and establish the necessary monuments. The joint commissioners having disagreed as to the water boundary, it was finally settled in 1871 by arbitration. Emperor William I. of Germany was chosen as arbiter, and he decided in favor of the American contention. In the meantime, operations were commenced on the land portion of the line; but it is evident that thorough work was not contemplated, from an agreement entered into between the commissioners in regard to the conduct of the field operations. This agreement was as follows:

> After discussing plans for determining and marking the line as far eastward as the Cascade Mountains, it was concluded to be inexpedient at the present time, in consequence of the great expense, consumption of time, and the impracticable nature of the country, to mark the whole boundary by cutting a track through the dense forest.
>
> It was therefore agreed to ascertain points on the line by the determination of astronomical points at convenient intervals on or near the boundary and to mark such astronomical stations, or points fixed on the parallel forming the boundary, by cutting a track of not less than 20 feet in width on each side for the distance of half a mile or more, according to circumstances. Further, that the boundary be determined and similarly marked where it crosses streams of any size, permanent trails, or any striking natural feature of the country.
>
> In the vicinity of settlements on or near the line it is deemed advisable to cut the track for a greater distance and to mark it in a manner to be determined hereafter.

Under the above agreement, which was subseqently applied to the whole line, work was prosecuted through the field seasons of 1858, 1859, and 1860, the results being that, of the entire boundary, 410 miles long, 190 miles were cleared and marked and 220 miles were not surveyed or marked in any way. The principal unsurveyed and unmarked portions are indicated below:

From summit of Rocky Mountains westward to Kishenehn Creek	13	miles.
Flathead River to Wigwam River	13	"
Wigwam River to point 6 miles east of Kootenai River	14	"
Point 4 miles west of Kootenai River to Yaak River	17	"
Yaak River to Mooyie River	24	"
Mooyie Trail to Kootenai River	14	"
Kootenai River to Kootenai Mountains	25	"
Kootenai Mountains to Clark Fork	9	"
Clark Fork to Columbia River	11	"
Similkameen River to Naisnuloh Station	12	"
Naisnuloh Station to Paseyten River	24	"
Paseyten River to Chuchuwanten Creek	6	"
Chuchuwanten Creek to Skagit River	17	"
Stream 6 miles west of Senehsay or Selacee River to De Lacy Trail from Whatcom to Fort Hope	16	"

From Columbia River to Similkameen River, a distance of about 96 miles, the line was marked by sixty-seven monuments, although even in this distance there are thirteen unmarked intervals greater than 2 miles, including three greater than 3 miles.

From Skagit River to stream 6 miles west of Senehsay or Selacee River, a distance of about 30 miles, there are intervals of about 1½, 3, 5, 4 and 6 miles in which there are no monuments.

From the De Lacy Trail to Point Roberts, a distance of about 46 miles, the line was well marked by forty-two iron pillars and one obelisk at Point Roberts. All other monuments established on the line were piles of stone or earth.

The Civil War followed soon after the completion of the field work of the Northwestern Boundary Survey, and probably on this account no report of the operations of the survey was published, although there is evidence that such a report was prepared.

No trace can be found of the manuscript of this report, however, although careful search has been made through the Departments at Washington and the files of Congress.

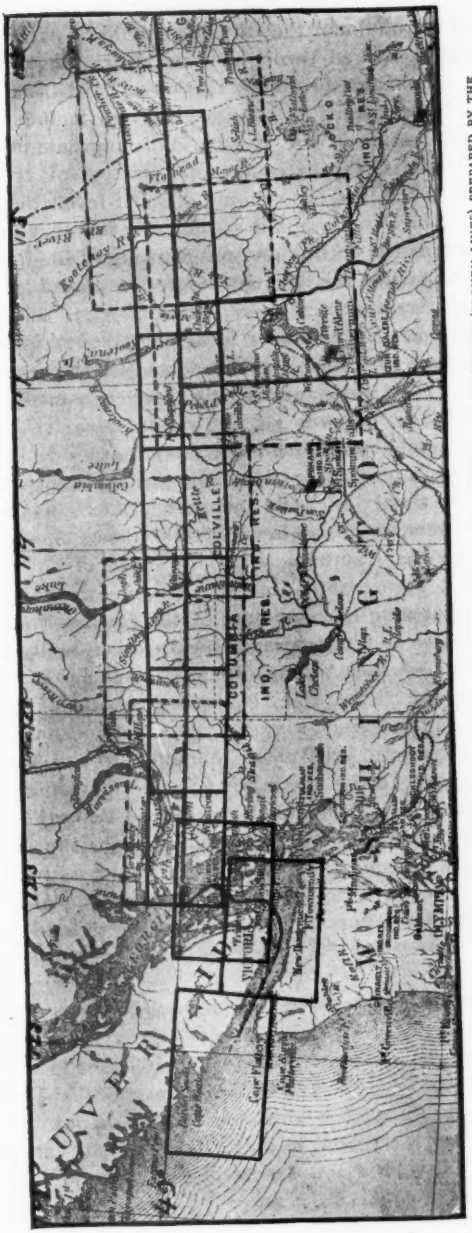
Various manuscript maps relating to the Northwestern Boundary

are on file at the State Department. The most important are ten detailed sheets, seven relating to the land portion of the boundary and three to the water portion. On the former are shown trails, timber, camps, monuments and vistas cut through the forest. These sheets are carefully drawn on the scale of 1:120,000, or about 1.89 miles to one inch, the relief being represented by hachures. A conventional sign indicating the timbered areas is also introduced.

In addition to the detailed map, there are other maps and tracings, one set having some geographic value, being a compilation from original sketches, notes, and surveys. These maps include the areas covered by the detailed maps and considerable territory besides, evidently having been compiled from observations secured by various members of the Northwest Boundary Survey while making journeys and reconnaissances in connection with the immediate work in hand. The relief is shown by sketch contours, and the accuracy obtained, as indicated by comparison with recent topographic surveys, is remarkable, considering the circumstances under which the maps were made. The scale is identical with that of the detailed maps, and it is probable that the contours were originally drawn for the purpose of serving as a guide for the development of the hachure work on the detailed maps. None of these maps have been published, except that a few lithographic copies of the detailed maps, enlarged to twice the scale of the originals, were prepared and had a limited distribution in a few of the Departments at Washington. The existence of these maps is not generally known, and it is probable that if copies had been available for the use of those interested in the mining properties in the Mount Baker district an inspection would have given sufficient evidence to settle satisfactorily the question whether the mines are in the United States or in Canada.

There is presented herewith an index map showing limits of the detailed and reconnaissance sheets.

There was also deposited by the British Minister in 1871 in the State Department an atlas comprising maps, views, and tables of geographic positions relating to the Northwestern Boundary. The information contained in this atlas is practically the same as that shown on the original maps prepared by the United States officials, except that the British atlas contains ten photographic views of monuments and vistas. With the atlas are tables of geographic co-ordinates, with descriptions of stations. According to these tables there are 161 monuments, marking parts of a boundary line 410 miles in length.



INDEX MAP, SHOWING LIMITS OF UNPUBLISHED DETAILED SHEETS (CONTINUOUS LINES) AND RECONNAISSANCE SHEETS (BROKEN LINES) PREPARED BY THE U. S. NORTHWESTERN BOUNDARY SURVEY, ON FILE IN THE STATE DEPARTMENT, WASHINGTON.

There can be no doubt that the line should be carefully traced and substantially marked throughout its entire length by a joint commission. Estimates for doing this work have been submitted to the State Department, and these estimates include the astronomical determination of the latitude and longitude of a number of additional points, the extension of a system of triangulation along the axis of the line, the running of spirit-levels over the line, the preparation of a topographic map of the territory adjacent to the line, as well as the cutting out and marking of the line by stone and iron monuments, the monuments to be placed at intervals averaging not more than a mile.

A large portion of the country to be traversed is without roads or trails. In fact, the conditions and difficulties at present are not much different from those which existed when the original commission decided that it was not practicable, on account of the difficulties, to establish the line completely.

The summit of the Cascades adjacent to the international boundary is above the timber-line, and immense glaciers lie athwart the line. A short summer comes between the storms of a late spring and those of an early autumn, while the snows of one winter are scarcely melted before they are replaced by those of the next. Turgid and impassable streams, born of the glaciers, flow between precipitous ridges and lofty granite peaks, making long detours necessary to an advance in any direction. On either side of the summit, below the timber-line, is a thick mantle of vegetation, with great firs and cedars growing up from a mass of tangled underbrush. The above are, briefly, the characteristics of the country along and adjacent to the line in the Cascades, and the same difficult conditions exist in a somewhat less degree along the remaining unsurveyed portion of the line. On account of the shortness of the practicable field season, it is believed that at least three or four years would be required to execute the surveys necessary to the proper marking of the line.

THE SCIENCE OF THE TIDES.

A Study in Physical Geography.

BY

ALEXANDER BROWNLIE.

The adherents of tidal science cannot avert the charge that the science has a defective title. The most convincing arguments advanced against its credibility have come from themselves. The science is wholly artificial, because it was created at a time when men were absolutely ignorant of the tides of the world.

In support of our thesis we cite as witness one of the masters, Prof. George Howard Darwin. His book, "The Tides," is the latest standard text-book of the science, from which we quote:

1. "The equilibrium theory is terribly at fault . . . utterly contradictory to fact." (Page 160.)

2. "It is nearly as much wrong as possible . . . It would seem as if the moon actually repelled water." (Page 161.)

3. "Both the dynamical and equilibrium theories must be abandoned as satisfactory explanations of the true conditions." (Page 180.)

4. "The form of equilibrium can never be attained by the ocean." (Page 151.)

5. "The tidal problem is insoluble." (Page 188.)

The same master further acknowledges that the direct attraction of the moon has never been measured; it has never been demonstrated that the moon can lift water, although the proof has been sought for diligently. By this expert evidence we know that the science rests on faith only; but that is not scientific.

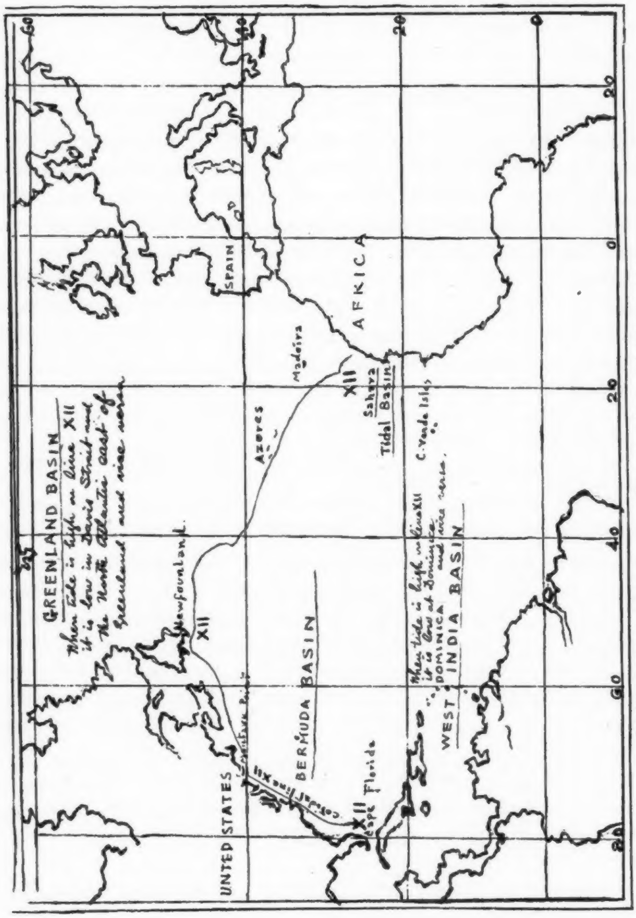
Nevertheless, Mr. Darwin sets it up again on a new basis—"The Correct Prediction of Tides":

6. "Good tidal prediction is one of the greatest triumphs of the theory of universal gravitation." (Page 250.)

7. "The utmost that can be expected of a tide-table is that it shall be correct in calm weather and with a steady barometer. But such conditions are practically non-existent." (Page 242.)

The admission in the seventh quotation renders void the claim in the sixth. Therefore the new basis is a failure also. Ere leaving this part of the subject, however, we make the point that the tide-tables for the year 1900 by the United States Coast and Geodetic Survey predicted the ordinary diminutive tides at Galveston on the day the waters of the Gulf inundated that city.

From that practical lesson we ask: If wind travelling 100 miles



SKETCH MAP of COTIDAL LINE XII
from Cape Florida to central southern Newfoundland & Atlantic Tidal Basins.
NOTE. The extension across the Atlantic is imaginary, but appears on all tide maps

an hour drove the waters to overwhelm Galveston, what could escape annihilation were theory waves, travelling 1,000 miles an hour, true?

In setting up physical geography as the basis for correct tidal-study we set it upon a sure foundation, because founded on observed facts, and we begin our study by observing carefully the longest and best-established co-tidal line in the Atlantic Ocean—co-tidal line XII. (meaning 12 o'clock; co-tidal means tide at same absolute time). That line forms the boundary of the United States from Cape Florida to Montauk Point; it then disappears from the eastern coast, but is observed again in central southern Newfoundland.

The tidal disclosures made by it are absolutely destructive to theory. For example, tide is instantaneous on it over 21° of latitude. Tide is also instantaneous on it over 24° of longitude; but the longitudinal difference is greatly aggravated by a theoretical extension across the Atlantic, because that extended line (across the Atlantic) means instantaneous tide over 60° of longitude. Whereas the moon, the supposed strongest tide-lifter, takes four hours to travel the distance!

Again, theorists admit that tide is twelve hours late daily in travelling to line XII.; that admission creates an extraordinary tidal tangle, because the moon is regular in its movements to the thousandth part of a second.

Moreover, the Atlantic has two flood-tides and two ebbs daily, operated on strict schedule time; and in accordance with that fact theorists admit that two floods start daily from the south. Suppose we grant it, it follows that two ebbs must start daily from the north—and we know by observation that ebbs travel as fast as floods—consequently there are four theoretical tides travelling in opposite directions 200 to 600 miles an hour!

In view of all this, our study of line XII. teaches us—

1. That tide is not due to a travelling wave, because it is instantaneous over 21° of latitude; whereas, theoretically, it takes over two hours to travel that distance.

2. That tide is not due to lunar attraction, because the moon cannot drive waves across its own path; that is not consistent with the original theory or the modern development.

3. That tide moves slowly and deliberately from a centre to the circumference; therefore Nature itself drops the word "speed"—in the sense of a globe-travelling wave—out of the problem.

4. That tide, studied by the new method—geographical observation—is absolutely destructive of the old theory.

The new method of observing, fortunately, has a precedent. One of the main objects of the Challenger Expedition in 1872 was to solve the problem of ocean currents. After a thorough observation of them it was finally demonstrated that the circulation of ocean currents was due to opposition of temperature. The moon has no hand in all that work. And we hereby challenge the claim of mathematicians that IT is the cause of the other circulation of the ocean—the tides.

Our method of study is not all destructive. On the contrary, it is strongly constructive; and in setting forth a new theory we claim, as a fundamental principle, that tide is due to opposition of level in contiguous masses of water, one mass standing at high level, immediately contiguous to another at low level.

Observation has demonstrated that such conditions exist in the Atlantic, and we single out three of these regions to illustrate the problem:

1. We select the region of line XII., or rather its basin, which we call The Bermuda Tidal Basin.
2. We name the region north of it The Greenland Tidal Basin.
3. We call the region south of it The West India Tidal Basin.

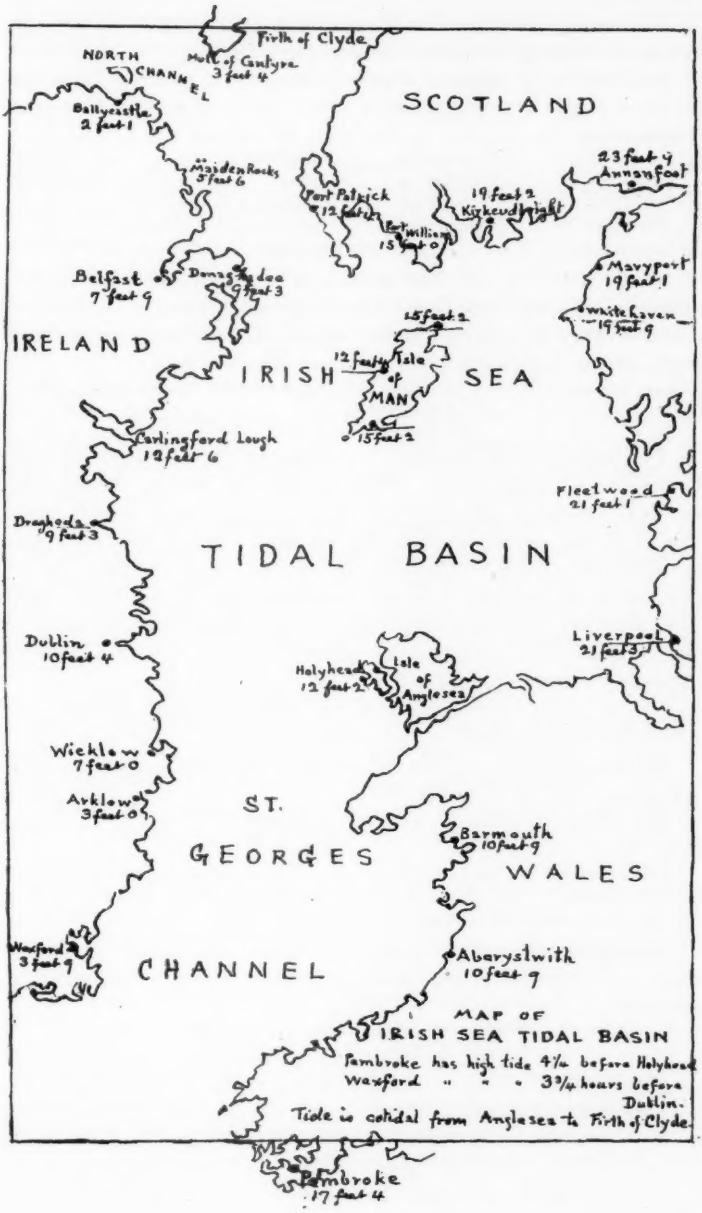
By observation we know that when tide is high in the Bermuda Basin it is low in the Greenland and West India Basins.

When tide is high in the Bermuda Basin it generates a motive power within its own mass, because of its high level—the power of gravitational pressure. We are persuaded that its higher waters must gravitate toward the contiguous lower waters. Hence, if that is correct, then gravitation is the key that unlocks the tidal mystery.

In like manner, when tide is high in the Greenland and West India Basins it is low in the Bermuda, and simultaneously their higher waters gravitate toward Bermuda's low level. Each time a basin is pressed to highest level a renewal of motive power is inevitable, and that motive power is not exhausted until it has pressed the low level up to the high level.

These three Atlantic basins possess an inherent motive power within their own masses every time a mass attains highest level—as self-acting of its kind as the actions of earth and moon.

The new tidal principle just disclosed is that of Double Pressure, and the same principle occurs in the Irish Sea; that sea receives a twofold supply through the two entrances, resulting in a simultaneous vertical lift extending from Anglesea to the Firth of Clyde; these two geographical units form one small co-tidal basin, and in that basin the water rises because of the double pressure.


Firth of Clyde
NORTH CHANNEL
Mull of Cantyre 3 feet 4
SCOTLAND
Ballycastle 2 feet 1
Maiden Rocks 5 feet 6
Port Patrick 12 feet 2
Portwilliam 15 feet 0
19 feet 2 Kirkcudbright
23 feet 4 Annanfoot
Belfast 7 feet 9
Donaghadee 9 feet 3
Maryport 19 feet 1
Whitehaven 19 feet 9
IRELAND
25 feet 2
12 feet 9
Isle of MAN
IRISH SEA
15 feet 2
Carlingford Lough 12 feet 6
Fleetwood 21 feet 1
Drogheda 9 feet 3
TIDAL BASIN
Dublin 10 feet 4
Liverpool 21 feet 3
Holyhead 12 feet 2
Isle of Anglesea
Wicklow 7 feet 0
Arklow 3 feet 0
ST. GEORGES CHANNEL
Barmouth 10 feet 9
WALES
Wexford 3 feet 9
Aberystwith 10 feet 9
MAP OF IRISH SEA TIDAL BASIN
Pembroke has high tide 4¼ before Holyhead
Wexford " " " 3¾ hours before Dublin.
Tide is cotidal from Anglesea to Firth of Clyde.
Pembroke 17 feet 4

The sea southwards from Anglesea is not co-tidal; on the contrary, the difference in time increases greatly.

Besides the principle of double pressure, that co-tidal basin discloses a large differentiation in the height to which tides rise. For example:

BRITISH SIDE.	MEAN RISE.	IRISH SIDE.	MEAN RISE.
Annanfoot	23 feet 9	Belfast	7 feet 9
Maryport	19 " 1	Carlingford Lough	12 " 6
Liverpool	21 " 3	Dublin Bay	10 " 4*
Holyhead	12 " 2	Wicklow	7 " 0

By the table we see that Britain is in receipt of an enormous supply compared with Ireland; at high tide there is an inclined plane sloping downwards from Britain; at low tide the inclined plane slopes downwards from Ireland. For example:

Mean low water.....Liverpool.....is 11 feet 3 below mean sea-level.
" " " ..... { Kingstown, / Dublin Bay, } .. 5 " 5 " " " "

The inequality of sea-level is permanent both at high tide and low in the Irish Sea Basin. The greater rise on the British side seems to be due to the fact that that side lies open to the direct line of pressure coming from the Atlantic. But in both channels, specially St. George's Channel, the direct effect of that line of pressure is seen in the relatively enormous rise at the Welsh ports compared with the diminutive rise at the Irish ports of Wexford and Arklow. The key to the position lies in the geographical formation of both channels.

We find that the height to which tides rise and the depth to which they fall is purely a geographical question. The rule is:

As mean low water falls below mean sea-level, so mean high water rises above mean sea-level.

Lord Kelvin, however, suggested another rule in his "Navigation":

"Why," he asked, "have we tides of twenty to forty feet in some places and only two or three feet in others? Because the waters have not time in twelve hours to take the equilibrium form." (Page 165.)

The figures in the Irish Sea table conflict with Kelvin's theory. As for the two and three feet tides the conflict is as great. For example:

Mean rise at Ballycastle Bay.....2 feet 1
Mean rise Mull of Cantyre.....3 " 4

The two stations are some twenty miles apart and co-tidal; yet the Scottish station receives fifty per cent. more water than the Irish. The facts of the Bay of Fundy also conflict; we observed its forty-feet floods succeeded immediately by forty-feet ebbs.

* The figures 10 feet 4 at Dublin refer to Poolbeg Light.

The tides of nature are visible and not invisible. They disclose themselves in a twofold action: first, current speed; secondly, speed of moving masses; the current speed is slow, but that of masses in motion is fast. For example:

Tide is high at Albany 9 hours 33 after Governor's Island, New York; but the current does not travel there at fifteen miles an hour. There is nothing occult about the masses in motion; the movement is visible and demonstrable. When a basin rises to high level the visible rise on the shore is slow, and likewise at ebbs the visible fall is slow. The fastest-known current occurs in the bore of the Tsien-Tang-Kiang, and its maximum speed, for a very short distance only, attains the enormous rate of eleven miles an hour.

With regard to its cause, we believe that problem is now solved by geographical analysis. The problem of double tides is also solved by the same analysis, and likewise the problem of the Mediterranean tides. All of these problems are, confessedly, insoluble by mathematics.

We have also observed that the rotation of the earth has no visible effect on tides; we have not found one case of acceleration or retardation that could reasonably be attributed to rotation on either side of the Atlantic, or anywhere on the globe; not even excepting the Chinese bore — which Mr. Darwin claims as due to rotation.

We have also observed that distance from the Equator avails nothing, for tides rise as high in Arctic regions as in Equatorial.

We deny the claim of theory that Atlantic tide-waves travel from the Pacific, and hereby challenge a demonstration.

There is a vast difference in the visible appearance of tides in the two oceans; in the one comparative regularity, in the other an exceedingly great irregularity.

Finally, we demand a separation of the tidal-lunar relationship, because there is no scientific proof of relationship.

As more accurate observation, some fifty years ago, wrested weather from supposed lunar control, so more accurate observation of tide, now, must sever the antiquated, unscientific relationship.

The case is a case of facts versus fancies, of observed gravitational pressure versus undemonstrated lunar attraction.

At the dawn of the twentieth century, after a guardianship of two centuries, the masters of the science confess that the actual tides of nature are insoluble by mathematics!

November, 1900.

THE POPULATION OF THE UNITED STATES

BY

HENRY GANNETT.

The population of the United States, the several States and the Territories, by the Twelfth Census, taken as of date June 1, 1900, was announced by the Census Office on October 30. Details regarding the population of certain States and of all cities having a population of 25,000 or more have also been given out in bulletins by that office.

By this Census are included in the population all human beings in the country, instead of excluding, as heretofore, Indians not taxed and whites on Indian reservations, leaving to Congress the duty of determining what shall constitute the representative population. From the population may be excluded aliens, Indians not taxed, *i.e.*, those under tribal relations, and illiterates in those States which have made literacy a qualification for suffrage, besides the inhabitants of the Territories, thus reducing the representative population considerably below the total population.

The population of the United States on June 1st last was 76,304,799. This includes the population of Hawaii, but not that of Porto Rico or the Philippines. The increase over the corresponding figures of 1890 was 13,235,043, or about 21 per cent. Between 1880 and 1890 the per cent. of increase was 24.86, thus showing that the rate of increase has suffered a decided diminution during the past ten years. Such a diminution is, however, to be expected as being in accordance with the general principle that as population increases, other things being equal, its rate of increase constantly tends to diminish. Moreover, during the last decade there has existed a specific reason for the reduction in the reduced immigration. During the decade between 1880 and 1890, 5,250,000 immigrants cast in their lot with us—a most unprecedented number; while during the decade just past the number of immigrants was reduced to 3,890,000—a diminution of 1,360,000. Whatever may be the effect of immigration upon the number of inhabitants and the rate of increase in the long run, there is no question but that a sudden change in it is immediately felt.

The following table shows the population of the the States and Territories in 1890 and 1900, with the numerical increase, the rate

of increase during the decade, and the number of inhabitants to a square mile in 1900:

	POPULATION, 1900.	POPULATION, 1890.	GAIN.	Percentage of Gain.	Density of Population.
Alabama	1,826,697	1,513,017	313,680	21	35
Alaska	63,441	32,052	31,389	98	..
Arizona	122,931	59,620	63,311	105	1
Arkansas	1,311,564	1,128,179	183,385	16	25
California	1,485,053	1,208,130	276,923	23	9
Colorado	539,700	412,198	127,502	31	5
Connecticut	908,355	746,258	162,097	22	182
Delaware	184,735	168,493	16,242	10	92
District of Columbia	278,718	230,392	48,326	21	city
Florida	528,542	391,422	137,120	35	10
Georgia	2,216,331	1,837,353	378,978	21	38
Hawaii	154,001	89,990	64,011	71	23
Idaho	161,772	84,385	77,387	92	2
Illinois	4,821,550	3,826,351	995,199	26	86
Indiana	2,516,462	2,192,404	324,058	15	70
Indian Territory	391,960	180,182	211,778	118	13
Iowa	2,251,853	1,911,896	339,957	18	40
Kansas	1,469,495	1,427,096	42,399	3	18
Kentucky	2,147,174	1,858,635	288,539	16	54
Louisiana	1,381,625	1,118,587	263,038	23	34
Maine	694,466	661,086	33,380	5	23
Maryland	1,190,050	1,042,390	147,660	14	120
Massachusetts	2,805,346	2,238,943	566,403	25	351
Michigan	2,420,982	2,093,889	327,093	11	42
Minnesota	1,751,394	1,301,826	449,568	35	22
Mississippi	1,551,270	1,289,600	261,670	20	34
Missouri	3,106,665	2,679,184	427,481	16	45
Montana	243,329	132,159	111,170	82	2
Nebraska	1,068,539	1,058,910	9,629	1	14
Nevada	42,335	45,761	loss 3,426	0	0
New Hampshire	411,588	376,530	35,058	9	46
New Jersey	1,883,669	1,444,933	438,736	30	251
New Mexico	195,310	153,593	41,717	27	1
New York	7,268,012	5,997,853	1,270,159	21	151
North Carolina	1,893,810	1,617,947	275,863	17	39
North Dakota	319,146	182,719	136,427	75	5
Ohio	4,157,545	3,672,316	485,229	10	101
Oklahoma	398,245	61,834	336,411	544	10
Oregon	413,536	313,767	99,769	32	5
Pennsylvania	6,302,115	5,258,014	1,044,101	20	140
Rhode Island	428,556	345,506	83,050	27	390
South Carolina	1,340,316	1,151,149	189,167	16	45
South Dakota	401,570	328,808	72,762	22	5
Tennessee	2,020,616	1,767,518	253,098	14	48
Texas	3,048,710	2,235,523	813,187	36	12
Utah	276,749	207,905	68,844	33	3
Vermont	343,641	332,422	11,219	3	38
Virginia	1,854,184	1,655,980	198,204	12	46
Washington	518,103	349,290	168,813	48	8
West Virginia	958,800	762,794	196,006	26	38
Wisconsin	2,069,042	1,686,880	382,162	23	38
Wyoming	92,531	60,705	31,826	52	1

The average number of inhabitants to a square mile in the main body of the country, excluding Alaska, Hawaii, Porto Rico, and the Philippines, was 25. In 1890 it was 21, showing an increase of four inhabitants per square mile.

The density of population ranged widely in different States—from one approaching the conditions in the most populous of the countries of Europe down to practically unsettled conditions. Leaving out of account the District of Columbia, which is substantially a city, the most densely-populated State was Rhode Island, with 390 persons to a square mile. This was closely followed by Massachusetts with 351. No other State had as many as 300, and between 200 and 300 to a square mile was New Jersey only; having between 100 and 200 persons to a square mile were five States—Connecticut, Maryland, New York, Ohio, and Pennsylvania. At the other extreme was Nevada, with only one inhabitant to three square miles.

The greatest numerical gain was made in New York, with more than one and a quarter millions; next Pennsylvania came, with more than a million; and Illinois, with nearly a million. The increase in these three States formed about one-fourth of that of the entire country. The increase in the single State of New York was greater than that in all the western States combined, and that in Pennsylvania about equal to it; while that in the little State of Massachusetts was more than half as great. In Nevada alone was there a loss. The highest percentage of gain was in Oklahoma—544 per cent. Three Territories—Arizona, Indian Territory, and Oklahoma—more than doubled in population; while Alaska, Hawaii, Idaho, Montana, North Dakota, and Wyoming added more than 50 per cent.

For discussion of these figures the States may be grouped in five divisions, which present characteristic differences, as follows:

North Atlantic, including New England, with New York, New Jersey and Pennsylvania;

South Atlantic, including the States bordering the Atlantic Ocean south of Mason and Dixon's line and including the District of Columbia and West Virginia;

North Central, including the States north of Ohio River and the south boundary of Missouri and Kansas, extending from Ohio west to include Kansas, Nebraska and the Dakotas;

South Central, including the States south of the last group and extending from Alabama westward to include Texas and Oklahoma;

Western, including all the States and Territories west of the above two groups.

The North Atlantic group is far the most densely settled, has much the largest proportion of urban population, and its industries consist primarily of manufactures and commerce. In the North Central group the density of population ranges widely from east to west, being dense in the eastern States and sparse in the western, which have many of the characteristics of the frontier. It contains a considerable proportion of urban population, but by no means as great as in the North Atlantic group, and its industries are, on the whole, agricultural, although manufactures and commerce are rapidly developing in the eastern part. These two groups of States receive nearly all the immigration, and consequently contain nearly all the population of foreign birth.

The South Atlantic group is predominantly agricultural, contains few cities of magnitude, and its manufacturing and commercial interests are comparatively slight. It contains a large proportion of negroes. It is a well-settled agricultural region.

The South Central group differs in different parts, like the North Central group, being well settled in the eastern part and sparsely settled toward the west, where it has frontier characteristics. It contains a trifling proportion of urban population, little manufactures, and is pre-eminently an agricultural region. This also contains a large proportion of negroes.

The Western group is, on the whole, sparsely settled, but it contains a diversified population, with a few large cities and many small ones, and has a diversity of interests, including grazing, farming, mining, manufactures, and commerce. It is in a very early stage of development, and at the same time all branches of industry are well represented. From the fact that it is sparsely settled its normal rate of growth is rapid.

The proportion of the population which is contained in each group of States is shown below:

	PER CENT.
North Atlantic	27
South Atlantic	14
North Central	35
South Central	19
Western	5
	100

The following table shows the proportional share of each group of States in the country's increase:

	PER CENT.
North Atlantic	28
South Atlantic	12
North Central	30
South Central	22
Western	8
	100

From the above it is seen that 58 per cent. of the entire gain of the country was made by the two groups of northern States, and that 34 per cent., or a little over one-third, was made by the two southern groups, while the western group received about one-twelfth of the entire gain made by the country.

The Atlantic States—which are, with the single exception of Florida, the thirteen original States, and those formed from them, Maine, Vermont and West Virginia—received two-fifths of the country's gain in population.

Similar percentages in 1890 show that the distribution of population among these different groups of States has suffered but slight change. The North Central group has lost one per cent.; while the South Central group has gained one per cent.—these being the only changes made as between these groups of States during the decade.

The following are the percentages of increase of the several groups of States:

	PER CENT. OF INCREASE.
North Atlantic	21
South Atlantic	18
North Central	18
South Central	27
Western	35

From the above it is seen that the North Atlantic States, although the most densely settled, show a rate of growth more rapid than either the South Atlantic or the North Central States. This comparatively rapid rate of growth is due to the fact that these States, as a whole, have got their second wind, so to speak; have changed their industry from agriculture, for which they were over-populated, to manufactures, for which they were rather sparsely settled, and are now in process of filling up under the new class of industries, thus conforming themselves to this new set of conditions. This is seen more clearly if we consider individual States. Massachusetts and Rhode Island, which are par excellence manufacturing States,

gained respectively at rates of 25 and 27 per cent.; New Jersey, a manufacturing and commercial State, 30 per cent.; New York, mainly commercial, 21 per cent., and Pennsylvania, in great part a mining and manufacturing State, 20 per cent. On the other hand, Maine and New Hampshire, in which manufactures have not yet made great progress, gained only 5 and 9 per cent. respectively, and Vermont, which is still in the agricultural stage, gained but 3 per cent.

The distribution of these gains between city and country will be discussed later.

The North Central States, on the other hand, are in part in a transition stage, being well populated for agriculture; but not having yet developed manufactures to any considerable extent, certain of them are in a state of depression incident to such conditions. Such is the case in Ohio, Indiana, Michigan, Wisconsin, Iowa, and Missouri. The great gain in Illinois is due to the phenomenal growth of the city of Chicago, and by no means to the development of the rural districts. Waiving this, not one of these States has grown at a rate equal to that of the country at large. The western portion of this group, however, being sparsely settled, would have grown rapidly during the last decade had it not been for unfortunate conditions peculiar to this region.

In the later years of the decade between 1880 and 1890 a great movement of population took place to the middle and western parts of Kansas, middle Nebraska, and the Dakotas, in the semi-arid regions, which was induced by a succession of wet seasons. This was accompanied by a great increase in land values, both in rural districts and in cities. The existing cities were greatly increased in population, and hundreds of new cities were founded. All this region witnessed a tremendous boom. A succession of dry seasons followed, which literally starved out the settlers, and the country was depopulated even more rapidly than it was settled. In 1885, at the beginning of the boom, Kansas had a population of 1,268,530; in 1888, near its crest, its population numbered 1,518,552; in 1890, by the Federal Census, it was 1,427,096, and in 1895 only 1,334,734. Thus the State gained in three years nearly 250,000 inhabitants, and subsequently lost nearly 200,000. These movements were not confined to the semi-arid belt, but were felt in all parts of the State. Measurably, the same thing took place also in Nebraska and the Dakotas, and these States are now slowly recovering from the effects of this boom.

The South Atlantic States are mainly agricultural, and are quite

fully populated for that industry; moreover, their growth is handicapped by the fact that they have been engaged for nearly a century in sending forth their children to populate the frontier regions to the westward, without any compensation in the form of immigration, which the North Atlantic States have enjoyed.

Among these States are Delaware, whose rate of increase was 10 per cent.; Maryland, with 14 per cent.; Virginia, with 12 per cent.; North Carolina, with 17 per cent., and South Carolina, with 16 per cent.—all less than the average of the country. Georgia reaches the average of the country, because of its mines and its newly-acquired manufacturing industries; while Florida, in spite of disastrous frosts, goes far beyond it with 35 per cent. This is because it is a sparsely-populated frontier State, now in process of filling up. West Virginia owes its rapid rate of increase—26 per cent.—in great part to the development of its immense coal deposits.

The South Central States present conditions similar, in many respects, to the North Central States, the eastern ones being quite well populated for the predominant agricultural industry, while the westernmost are now in process of filling up.

Alabama, Mississippi, and Louisiana have grown at rates equal to or slightly above that of the United States; while the States north of them—Kentucky, Tennessee and Arkansas—have grown much more slowly. In the cases of Kentucky and Tennessee this is probably due to their density of population—54 and 48 to a square mile—and to the character of their industries, which are still largely agricultural. Arkansas may have been seriously drained to fill Indian Territory and Oklahoma, both of which have filled up at a phenomenal rate, their rates of increase being respectively 118 and 509 per cent. It is interesting to note that, while the lands of Indian Territory are held in common by some 56,000 Indians, there are settled upon them not less than 335,000 whites, most of whom are "intruders" and squatters. Texas, with a vast area of unoccupied land, has been filling up rapidly.

The Western States, in spite of the depression which they have suffered through the demonetization of silver, have grown at a surprisingly rapid rate, although not as swiftly as in the preceding decade. Every one of these States, with the exception of Nevada, has gained at a more rapid rate than the country at large. Nevada, dependent entirely upon its mines, with very little water to make its fertile soils available for agriculture, has for many years been in a failing condition. Idaho, Montana, and Arizona have grown at

very rapid rates. Colorado, Wyoming, and Utah have made excellent gains, considering the prevailing conditions of business. New Mexico, long settled by a population of Mexican descent, is using most of its available water supply in irrigation, and has made comparatively small gains. On the coast, California has gained the least, and Washington the most. Of the three States, probably Washington can sustain by agriculture the largest population in comparison with area, as it has a more ample rainfall.

The following table exhibits the rank of the States and Territories in 1900 and 1890.

1900.	1890.	1900.	1890.
1. New York.	New York.	27. Nebraska.	Maryland.
2. Pennsylvania.	Pennsylvania.	28. West Virginia.	West Virginia.
3. Illinois.	Illinois.	29. Connecticut.	Connecticut.
4. Ohio.	Ohio.	30. Maine.	Maine.
5. Missouri.	Missouri.	31. Colorado.	Colorado.
6. Texas.	Massachusetts.	32. Florida.	Florida.
7. Massachusetts.	Texas.	33. Washington.	New Hampshire.
8. Indiana.	Indiana.	34. Rhode Island.	Washington.
9. Michigan.	Michigan.	35. Oregon.	Rhode Island.
10. Iowa.	Iowa.	36. New Hampshire.	Vermont.
11. Georgia.	Kentucky.	37. South Dakota.	South Dakota.
12. Kentucky.	Georgia.	38. Oklahoma.	Oregon.
13. Wisconsin.	Tennessee.	39. Indian Territory.	Dist. of Columbia.
14. Tennessee.	Wisconsin.	40. Vermont.	Utah.
15. North Carolina.	Virginia.	41. North Dakota.	North Dakota.
16. New Jersey.	North Carolina.	42. Dist. of Columbia.	Indian Territory.
17. Virginia.	Alabama.	43. Utah.	Delaware.
18. Alabama.	New Jersey.	44. Montana.	New Mexico.
19. Minnesota.	Kansas.	45. New Mexico.	Montana.
20. Mississippi	Minnesota.	46. Delaware.	Idaho.
21. California.	Mississippi.	47. Idaho.	Oklahoma.
22. Kansas.	California.	48. Arizona.	Wyoming.
23. Louisiana.	South Carolina.	49. Wyoming.	Arizona.
24. South Carolina.	Arkansas.	50. Alaska	Nevada.
25. Arkansas.	Louisiana.	51. Nevada.	Alaska.
26. Maryland.	Nebraska.		

Out of the 51 States and Territories, 15 have retained their relative rank, including the 5 largest. Massachusetts, in spite of her great gain in population, has dropped from 6th to 7th place, having been passed by Texas. Kentucky and Georgia have changed places, to the advantage of the latter State; Tennessee and Wisconsin have also similarly exchanged positions; Virginia has dropped two places, and New Jersey has risen a similar amount. Kansas has gone down from 19th to 22nd, having been passed by Minnesota, Mississippi, and California. New Hampshire has dropped from 33rd

to 36th, and Vermont from 36th to 40th. The most phenomenal rise in the list is that of Oklahoma—from 47th to 38th place.

The cities containing a population of 25,000 and over numbered, in 1900, 159, with a total population of 19,694,625, or 26 per cent. of the total population. In 1890 the same cities had a combined population of 14,855,489, or 24 per cent. of the population; and in 1880, 9,933,927, or 20 per cent. The increase in these cities during the past ten years is thus less than in the decade between 1880 and 1890. The total increase in population of the United States from 1890 to 1900 was 13,235,043. Of this number the increase in these 159 cities was 4,839,136, or nearly 37 per cent. of the increase of the country. In several of the States the increase in their cities of 25,000 or more inhabitants formed nearly all of the increase of the States, showing that the smaller cities and the rural districts were nearly at a standstill. Thus, in New York State the increase in the cities of 25,000 or more inhabitants constituted 90 per cent. of that of the entire State; indeed, the increase in New York City alone was nearly 75 per cent. of that of the State. In Illinois the increase in the cities constituted 65 per cent. of that of the State, and here again a single city, Chicago, was responsible for not less than three-fifths of the State's increase in population. In Rhode Island the increase in these cities constituted 76 per cent. of that of the State; while in the City of Providence alone the gain was 52 per cent. of that of the State. In Ohio the increase in the cities was 62 per cent. of that of the State, in Massachusetts 68 per cent., in New Jersey 55 per cent., in Connecticut 63 per cent., and in Pennsylvania 53 per cent.

Excluding the population of these cities from that of the country in 1890 and in 1900, the remainder of the population made a gain of only 15 per cent. during the decade, or less than half that made by these cities.

Of these 159 cities, one, New York, had a population of 3,437,202, making it the second city of the world in population and the first city of the world which exists under a single municipal organization, since London is in organization not a single city, but a group of cities. Besides this, Chicago and Philadelphia exceeded a million each in population. Three cities follow them, with population exceeding half a million, viz.: St. Louis, Boston, and Baltimore. Including these six cities, there were in 1900 thirty-eight cities exceeding 100,000 inhabitants each—an increase of ten during the decade.

The cities were distributed very unequally over the country, the

North Atlantic States containing not less than 51 per cent., or more than half of the urban population under this definition. The North Central States contained 31 per cent., the two sections composing the Northern States containing, therefore, more than four-fifths of the urban population of the country; the South Atlantic States contained only 7 per cent., and in the South Central States only 6 per cent. was found, while the Western States contained but 5 per cent.

Similar differences between the sections of the country are seen in respect to the proportion of the population which was contained in these cities. Thus, in the North Atlantic States 48 per cent., or nearly one-half of the population, was contained in their cities of 25,000 or more; in the North Central States 23 per cent.; while in the South Atlantic only 12 per cent. was contained in these cities, and in the South Central only 8 per cent. and 25 per cent. of the population of the Western States was urban.

The following table shows the changes in rank of the cities of 100,000 or more inhabitants between 1890 and 1900:

RANK OF CITIES OF MORE THAN 100,000 INHABITANTS.

1900.	1890.	1900.	1890.
1. New York	New York.	20. Providence	Omaha.
2. Chicago	Chicago.	21. Indianapolis	Rochester.
3. Philadelphia	Philadelphia.	22. Kansas City	St. Paul.
4. St. Louis	St. Louis.	23. St. Paul	Kansas City.
5. Boston	Boston.	24. Rochester	Providence.
6. Baltimore	Baltimore.	25. Denver	Denver.
7. Cleveland	San Francisco.	26. Toledo	Indianapolis.
8. Buffalo	Cincinnati.	27. Allegheny	Allegheny.
9. San Francisco	Cleveland.	28. Columbus.	
10. Cincinnati	Buffalo.	29. Worcester.	
11. Pittsburg	New Orleans.	30. Syracuse.	
12. New Orleans	Pittsburg.	31. New Haven.	
13. Detroit	Washington.	32. Paterson.	
14. Milwaukee	Detroit.	33. Fall River.	
15. Washington	Milwaukee.	34. St. Joseph.	
16. Newark	Newark.	35. Omaha.	
17. Jersey City	Minneapolis.	36. Memphis.	
18. Louisville	Jersey City.	37. Los Angeles.	
19. Minneapolis	Louisville.	38. Scranton.	

Nine of the above cities, including the six largest, maintained the same rank. San Francisco and Cincinnati each fell two places, their positions being taken by Cleveland and Buffalo; New Orleans and Pittsburg exchanged places; Washington fell below Detroit, and Milwaukee and Minneapolis below Jersey City and Louisville; Providence gained four places, and Indianapolis five places. The most

striking feature of the table is the great drop in Omaha, which fell from 20th to 35th place.

The following table shows the population of these cities, with their increase and the rate of increase.

CITIES.	1900.	INCREASE FROM 1890 TO 1900.	
		Number.	Per cent.
New York, N. Y.	3,437,202	944,611	37.8
Chicago, Ill.	1,698,575	598,725	54.4
Philadelphia, Pa.	1,293,697	246,733	23.5
St. Louis, Mo.	575,238	123,468	27.3
Boston, Mass.	560,892	112,415	25.0
Baltimore, Md.	508,957	74,518	17.1
Cleveland, Ohio.	381,768	120,415	46.0
Buffalo, N. Y.	352,387	96,723	37.8
San Francisco, Cal.	342,782	43,785	14.6
Cincinnati, Ohio.	325,902	28,994	9.7
Pittsburg, Pa.	321,616	82,999	34.7
New Orleans, La.	287,104	45,065	18.6
Detroit, Mich.	285,704	79,828	38.7
Milwaukee, Wis.	285,315	80,847	39.5
Washington, D. C.	278,718	48,326	20.9
Newark, N. J.	246,070	64,240	35.3
Jersey City, N. J.	206,433	43,430	26.6
Louisville, Ky.	204,731	43,602	27.0
Minneapolis, Minn.	202,718	37,980	23.0
Providence, R. I.	175,397	43,451	32.8
Indianapolis, Ind.	169,164	63,728	60.4
Kansas City, Mo.	163,752	31,036	23.3
St. Paul, Minn.	163,065	29,909	22.4
Rochester, N. Y.	162,608	28,712	21.4
Denver, Colo.	133,859	27,146	25.4
Toledo, Ohio.	131,822	50,388	61.8
Allegheny, Pa.	129,896	24,609	23 3
Columbus, Ohio.	125,560	37,410	42.4
Worcester, Mass.	118,421	33,766	39.8
Syracuse, N. Y.	108,374	20,231	22.9
New Haven, Conn.	108,027	26,729	32.8
Paterson, N. J.	105,171	26,824	34.2
Fall River, Mass.	104,863	30,465	40.9
St. Joseph, Mo.	102,979	50,655	96.8
Omaha, Nebr.	102,555	37,897	26.9
Los Angeles, Cal.	102,479	52,084	103.3
Memphis, Tenn.	102,320	37,825	58.6
Scranton, Pa.	102,026	26,811	35.6

It is seen that the gain in New York City alone is nine-tenths as great as that in the whole group of Western States.

In nearly every State the cities of 25,000 inhabitants or more, collectively, have increased in population more rapidly than the remainder of the State. This is the case with all the North Atlantic States, with the exception of Vermont, which contains no large cities; with the North Central States, with the exception of the

Dakotas, which contain no large cities; of Nebraska, whose large cities were, it is said, *padded* in 1890; and of Minnesota, in which agricultural interests are still increasing rapidly.

In most of the Southern States, also, the cities have grown more rapidly than the remainder of the State; but the reverse is the case in West Virginia, where mining is causing rapid development, and in South Carolina, whose only city is Charleston, whose commercial development is extremely slow. The reverse is the case, also, in Louisiana, where, although New Orleans, its sole large city, shows a fairly rapid growth, the remainder of the State is filling up fast, owing to the stimulus afforded by fertile cotton and sugar lands. In Mississippi, Indian Territory, and Oklahoma there are no large cities. Among the Western States and Territories, Wyoming, New Mexico, Arizona, Idaho, and Nevada contain no large cities. In Colorado and Utah the cities have not grown as rapidly as the remaining parts of the State, although both city and State have increased with more than the average rapidity.

If we now make a closer separation between the urban and the rural elements of the community, classifying as urban all dense bodies of settlement numbering 8,000 or more, and regarding the remainder as rural, we find that in every New England State, together with New York, the rural element has lost in numbers during the past decade, all the gains made in these States being in the cities. The losses in the rural portions are not in any case great, but they are sufficient to show unmistakably that, so far as the industry of agriculture goes, these States are finished, and their progress hereafter is to depend, as it has for some decades past, upon manufactures and commerce—industries which are pursued only in cities. In Pennsylvania and New Jersey there has occurred some increase of the rural element—an increase only a fraction as great, however, as that of the urban element. Going farther west, in Ohio, the increase in the rural element was but 2 per cent.; in Indiana but 1 per cent.; in Michigan, 8 per cent.; in Illinois, 9 per cent., and in Iowa 14 per cent.—showing a gradual increase in the rate of growth of the rural element as we go westward and northward into regions more sparsely settled and more favorable for agricultural pursuits.

In the Southern States the gain in the rural districts does not differ greatly in any case from the gain in the cities.

This is but an amplification of the proposition laid down in the discussion of the rates of increase of the total population of these States.

NOTES ON GEOGRAPHICAL EDUCATION.

BY

RICHARD E. DODGE.

GEOGRAPHICAL MEMOIRS FOR TEACHERS' USES.—The New Jersey Geological Survey published several years ago a special memoir on the Physical Geography of New Jersey, for the use of teachers in the State. This memoir was an exhaustive and detailed study of the physical features of New Jersey, perhaps too detailed for the uses of general teachers, but yet on the right lines. It furthermore emphasized through its appearance the increased public interest in good geography teaching. Another similar report was published by the State of Missouri (see this Bulletin, XXIX, 2), and proved very successful.

The most recent instance of State interest in geography teaching is in the case of Wisconsin, where the Geological and Natural History Survey has established an Educational Series of Bulletins, of which the first has appeared this year. This Bulletin is by Professor Rollin D. Salisbury, of the University of Chicago, and Mr. W. W. Atwood, of the Chicago Institute, and is devoted to the geography of the region about Devil's Lake and The Dalles of the Wisconsin, with some notes on its surface geology. The Bulletin is a handsomely illustrated and well-printed large octavo volume of 150 pages, divided into five chapters, as follows: General Geographic Features; Outline of the History of the Rock Formations which show themselves at the Surface; General Outline of Rain and River Erosion; Erosion and the Development of Striking Scenic Features; The Glacial Period. All the chapters deal especially with the region in question except III, in which the development of streams is considered in detail, with illustration from Wisconsin. This chapter is a very good and readable summary of the principles of planation, and is a good reference for teachers outside of Wisconsin.

Valuable and stimulating as the Bulletin is, it is to be criticised, as was its predecessor in New Jersey from Professor Salisbury's pen, as available for the specially-trained teacher only. The material is too technical for the teacher without special training in geography, and cannot, except in its illustrations, be of great assistance to a large number of teachers. It is to be hoped that future attempts

along this line may be more generally usable, without losing any scientific value through simplification and popularization.

THE SECONDARY SCHOOL COURSE AT THE CHICAGO INSTITUTE.—The courses of study in all branches of the Chicago Institute are particularly interesting from the standpoint of geography, owing to the amount of attention that is given to the earth sciences in the secondary course, as well as to the almost unique plan for elementary school work. In each of the four years of the high school there is a year course in some earth science, so that the course as a whole for the twelve years of the elementary and secondary school follows one unified, progressive plan. It is evident, however, from a study of the outlines thus far published, that the other groups of sciences do not receive an equally strong or just amount of attention. The plans for the elementary, secondary, and pedagogic schools will appear monthly in the *Course of Study*, Chicago Institute, Academic and Pedagogic, for sale by the Institute.

In the elementary course very emphatic attention is given to physical geography, so that a good foundation is laid for scientific work in the high school. The first year, called ninth grade, is devoted to the study of the Physiography of the Land, including particularly the physiographic processes and their results as seen about Chicago and in other parts of the world. The work is largely based on field trips about Chicago, and is more advanced in its point of view than would be advocated by many for a course in the last year of the high school.

The second year is devoted to meteorology and to palæontology. The meteorology, so far as outlined, will be based largely on observational work about Chicago, and opens with considerations of the constituents and distribution of the atmosphere, followed by temperature and pressure.

The third-year course deals with geology, particular emphasis being devoted to the historical aspects. The work opens with a study of rocks and rock structures, followed by a study of the development of the leading physiographic regions of the eastern United States. This will be in turn followed, according to announcement, by historical geology and a study of continental evolution.

In the fourth-year course, entitled anthropogeography, it is intended to summarize and apply the principles of the first three years, as seen in the study of nations and peoples in relation to their environment.

In the work as outlined for each month references are given to

the best text-books and sources of collateral reading, though it should be noted that the books are not always accurately listed as to title, etc. The plans for the year, when complete, will be of great value to all teachers, for the whole field of earth sciences will be so presented that any teacher can see it as a whole with ease.

The course as presented is widely at variance with the possibilities in most secondary schools, and will undoubtedly meet with much adverse criticism. The experiment will be watched with great interest by all concerned in secondary work, because of the inkling that it ought to give as to the abilities of pupils in the first years of the secondary school to deal satisfactorily with certain aspects of the earth sciences, that many teachers believe have but small reason for being studied *in extenso* in high schools.

. Geographical Education at the British Association for the Advancement of Science, 1900.—The British Association for the Advancement of Science devotes an increasing amount of attention each year to problems in education. In fact, the problems have become so important in the work of the Association that all the sections have petitioned the Council to establish an educational section. The geographical section has long given a dignified place to educational papers by setting aside one session for their presentation. In 1900 two papers were given in this session, and elicited an interesting discussion.

The first paper was devoted to Progress of Geographical Instruction in Elementary Schools, particularly as evidenced by the success of the efforts in the West Riding of Yorkshire in carrying out the reforms recommended by the Royal Geographical Society some years ago. The principal advances announced by the author, Mr. T. G. Rooper, an inspector of schools, are well summarized by the following extract from the report given in the Geographical Journal for October:

> The chief reforms consisted in the intelligent study of local geography through local maps and models, and in object lessons which explained the principles of physical geopraphy. The reliefs and models led up to the art of reading maps and to the demand for better maps. Such lessons were an excellent introduction to reasoning, and proved how little there was that was purely arbitrary even in the sites of towns and villages in the neighbourhood, much less in the industries which were carried on in them. The necessity for good wall-maps was now apparent, and correctly drawn details were demanded in place of vague and inaccurate sketches. The symbols on the wall-map were vague and meaningless unless a context and significance were given them by previous practice in the building up of local plans and maps. The scholar had to be taught with care how to translate the symbols of the

wall-map back into the forms of nature which they, however inadequately, represented. The value of graphic work in teaching geography was insisted on. The mere copying and coloring maps of various parts of the world was rather an exercise in drawing than in geography. Each map should be drawn to serve some definite purpose. It should disentangle from a complex whole some particular part which analysis brought to light and illustrate it with precision and simplicity. Further, the sketch-maps should proceed from simpler studies to more complex, and no map should be made of a country as a whole until the leading features had been dealt with separately, and thus the "constructive" method of teaching geography was introduced. In conclusion, the formation of local geographical societies for educational purposes was recommended, and an account was given of the formation and working of the Southampton Geographical Society.

The second paper, by Mr. E. G. Wethey, was devoted to the teaching of commercial geography, which has very evidently become more rationalized in Great Britain than in the United States, in consequence of the unremitting efforts of a few leaders in the field—like Mr. Chisholm, Dr. Mill, and Dr. Herbertson. The author described his methods in detail, and exhibited a large series of original lantern-slides devoted to this topic.

PHYSICAL GEOGRAPHY IN THE HIGH SCHOOL.—Two recent papers from the pen of Professor W. M. Davis, of Harvard University,* deserve attentive reading by all interested in geography in the secondary schools.

The first paper is devoted to a discussion of the logical scope of secondary school physiography, to a consideration of the most modern and most culture-bearing point of view, and to an outline of the topics that may, to the author's mind, be rightfully included in the course. The second article treats of "practical exercises," including suggestions for laboratory work in reference to the topics selected in the first article, and closes with a statement of the present and future place of geography in the school curriculum.

Professor Davis supports strongly the scope of secondary school physical geography as outlined by the sub-committee of the Committee of College Entrance Requirements† and approved and published by the Association as "the physical environment of men," under which the principal headings are "the earth as a globe, the atmosphere, the oceans, and the lands."

Considering the point of view that obtains in reference to physical geography, the author shows how the subject has profited from

* Physical Geography in the High School, *School Review*, Vol. 8, Nos. 7 and 8, September and October, 1900, pp. 388–404; 449–456.

† *Journal of School Geography*, Vol. II, September, 1898, pp. 248–262. *Proceedings National Educational Association*, 1898, pp. 973–984; 1899, pp. 780–799.

the application of the theory of evolution—primarily contributed from geology and biology—and then shows that modern physical geography differs from the old, especially in two phases; first, that

in the earlier books, explanation was offered only for the more active phenomena, such as winds, currents and volcanoes; geographical features that were not evidently the result of active processes were merely described. In the newer books the attempt is made to extend explanation uniformly all over the field of study;

and secondly, that every item is presented

as an element of the environment in which the life of the earth has been developed, and by which it is still conditioned at every turn. This second test of modernized treatment is as valuable as the first.

Continuing, the author remarks in reference to the increased value that comes from such a point of view:

When the applied treatment of the subject is understood it will be recognized that plants, animals, and man should not be given special chapters for themselves in the modern limitation of the contents of physical geography, for the very sufficient reason that mention of them is distributed all through the subject. Gravity determines the "standing" position of plants and animals. Latitude and longitude should be taught as devices by which man takes advantage of the form and rotation of the earth to determine his position on it, not as abstract mathematical problems. The chapters on temperature and moisture give opportunity for mentioning many appropriate consequences as to the distribution of plants. Under the description of the shallow border of the oceans, where the waters lie upon the so-called "coastal shelf," proper opportunity is found for referring to these waters as the habitat of food fishes, and therefore as valuable fishing grounds. A general account of the larger land-forms leads up to the control exerted by continents, mountains (especially the Himalaya) and deserts (especially the Sahara) upon the distribution of man and animals. Under mountains reference is made to their significance as refuges for conquered tribes or peoples. Avalanches and landslides are not finished with a description and explanation of inorganic phenomena alone; they are also presented as dangers to which people living in mountain valleys are subjected. Here we may well introduce Guyot's eloquent sentence as a practical guide in our work: "To describe without rising to the causes or descending to the consequences is no more science than merely and simply to relate a fact of which one has been a witness." The phrase "causes and consequences" thus comes to serve as a touchstone by which both the explanatory and the applied treatment of the subject may be easily tested.

With such an understanding of the field, special chapters on man, animals, and plants are not logical or necessary, however much conservatism may demand their inclusion in a text-book from the standpoint of sales, and it is to be noted that the author has followed this plan in his own well-known text-book for secondary schools. Similarly, the author does not believe in including areal geography in a course that is primarily given from the standpoint of causal relations rather than of space.

Following these introductory paragraphs, the author outlines in some detail his views of the topics rightfully to be included under

the headings—The Atmosphere, The Ocean, Activities of the Lands, Features of the Lands, The Waste of the Land, Climatic Control of Land-Forms.

In the second paper, the contents of which have been sufficiently noted above, the author closes with the following "belief" in reference to the place of general physical geography in the school curriculum:

> My belief is that the subject will not remain very long in the better high schools, and that, as it descends into the grammar schools, its place will be taken by elective courses near the end of the high-school course. The reasons for this belief are as follows: First, a number of good grammar schools are already teaching, under "geography" or "physical geography" much material recommended in the National Educational Association report as appropriate for the first year of the high school. Second, the rapid improvement of the grammar-school course in general geography, by omitting much old memoriter work and compressing the valuable remainder into shorter time, is actually providing a place for physical geography in the last year of the grades. Such a change must come to be generally approved when it is seen how large a part of elementary physical geography is within reach of the grammar schools, and when it is remembered that every study thus added to the lower grades reaches a vastly greater number of school children than it would reach in the high school. Still more important is the third and final reason, namely, a growing belief that the existing method of teaching geography in the grades is not rational enough to stimulate as fully as it should the mental activity of school children; the remnants of traditional methods in geography by which young intelligence is often hampered should therefore be replaced by an increasing attention to explanatory and practical methods, such as the subject of physical geography affords in an admirable way. For the present, the establishment of a good course in physical geography in the first high-school year is probably the best general plan; but it is not likely that the subject will hold a permanent place there. Ten years hence, elementary physical geography will have found its way into many grammar schools; twenty or thirty years hence, the high school that has physical geography in its first year and not in its third or fourth will be considered old-fashioned.

The Size of Elementary Geography Texts.—The recent appearance of the Tarr and McMurry series of geographies in octavo form marks the first American success in publishing an elementary geography smaller than quarto size, and has aroused much interested speculation and comment. Other publishers have considered the possibility of an octavo series, and have feared that the strength of public opinion did not warrant the experiment. The objections to the reduction in size have been varied, and some of them curious, the greatest objection being that it would be impossible to print the necessary maps in octavo size. Though the recent attempt has not wholly succeeded in reference to the maps, it has shown that good and workable maps can be printed in octavo size. Perthes' *Taschen-Atlas* (Gotha), however, presents an ideal in refer-

ence to octavo maps toward which American publishers should push as rapidly as possible. Perhaps the most curious objection to the decrease of size, and one that has great weight in certain quarters, is that pupils no longer have any receptacle in which to carry loose papers between school and home.

While this attempt has been in progress in America, it is very interesting to note that in England there is an equally strong prejudice against increasing the size from octavo to quarto, and combining the atlas with the text. The English adaptation of Frye's Geography, published as the *Illustrated School Geography*, by Andrew J. Herbertson, was the first large-sized school geography in England, and was severely criticised as regards size and weight. Not only in England but in France and Germany the most used texts are of small size. Kirchhoff's *Erdkunde*, in two volumes, is large octavo, but contains no atlas, the student being expected to use some school atlas like that noted above. Foncin's *Géographie*, in four volumes, though not octavo, is very much smaller and of less weight than our school geographies; the maps therein are cheaply printed, and are not poor because of the size of the book. The smallest set of school geographies known to the writer is that in use in the schools of New Zealand—a set of five, each approximately 7 x 5 inches, and the largest containing but 100 pages. The maps in this series are black and white outline maps entirely.

Considering the widespread use of small school geographies the delay in their appearance in this country is absurd. In the course of time, with greater experience in map-making, it is to be expected that the old-fashioned geography will be a thing of the past, as it deserves to be.

MAP NOTICES.

BY

HENRY GANNETT.

THE ACTIVE INTEREST which has recently been awakened in forests and forestry has received another illustration in the issue by the Geological Survey of the State of a series of forest maps of New Jersey. The first of these represents the entire State upon a scale of five miles to an inch, showing, by shades of color, the proportion which the wooded areas bear to the total area.

The principal wooded area of New Jersey is in its southern, level part. South of latitude 40° 20′ these plains are almost solidly covered with forest, principally, if not entirely, of yellow pine. The secondary area is in the ridges and hills of the northern part of the State, especially near the boundary with New York. Here also the proportion of timber land runs very high.

Besides this map the Geological Survey has issued six sheets, upon a scale of one mile to an inch, showing in detail the wooded areas of the northern half of the State.

These maps accompany reports upon the woodland and forests of the State, by Mr. C. C. Vermeule, Gifford Pinchot, and others, constituting the greater part of the Annual Report of the Survey for the year 1899.

The Transcontinental Triangulation and the American Arc of the Parallel. Special Publication No. 4, U. S. Coast and Geodetic Survey. Washington. Government Printing Office. 1900. Quarto, pp. 870. With Many Cuts and Other Illustrations and Two Maps.

The measurement, by geodetic methods, of the arc of the parallel of 39° north latitude within the limits of the United States was commenced in 1872 and completed in 1898—a period of twenty-seven years. The eastern end of this arc is at Cape May, N. J., in longitude 74° 56′, and the western end at Point Arena, Cal., in longitude 123° 42′. The length of the arc is 2,625 miles, or, in longitude, 48° 46′. This is the longest arc of a meridian ever measured by any one Government, and its measurement is one of the most important, if not the most important, contribution to a knowledge of the shape and size of the earth which has ever been made. Moreover, this belt of triangulation provides no fewer than sixteen

States with a fundamental and reliable basis for the extension of topographic surveys.

In the course of this work ten base-lines have been measured and expanded, viz.: on Kent Island, Md., which is the most eastern; at St. Albans, in West Virginia; at Holton, Ind., Olney, Ills., and in the American Bottom in the same State, opposite St. Louis; at Versailles, Mo., Salina, Kan., Colorado Springs, Colo., Salt Lake, Utah, and the Yolo base in the Sacramento Valley of California.

Altogether 308 stations have been occupied in the triangulation. At 109 stations the latitude has been determined astronomically, at 73 stations azimuth has been determined, and at 37 stations longitude has been determined by the use of the telegraph.

The eastern portion of this belt passes mainly through a country of wooded hills and mountains—the Appalachians, which present many serious difficulties, though none of them were new to the men engaged upon the work. The central portion is through a region partially timbered—prairies, or barren plains—and here the difficulties were not great. Through both these sections the distances between stations are comparatively small, but in the western portion of the belt—that is, from the Rocky Mountain front in Colorado west to the Pacific coast—the conditions are quite different. The stations consist almost entirely of high mountains, ranging from 9,000 to 14,000 feet, and more, in altitude. The figures are large, the distances between stations being, on an average, fully 100 miles, and in one case—from Uncompahgre Peak, in the San Juan Mountains of Colorado, to Mount Ellen, in the Henry Mountains of Utah—the distance is approximately 180 miles.

The adjustment of the system has been made simply. After making the station adjustments, the figure forming the expansion about each base-line was adjusted by itself; then each belt of triangulation connecting one base expansion with the next was adjusted to itself and to the adjusted base expansions at its extremities.

It has been found, as a result of this measurement, that the form and dimensions of the 39th parallel within the United States do not conform either to the Clarke or the Bessel spheroid, but that it lies between the two. An interesting incident connected with the results is the fact that the difference in station error between Colorado Springs, at the east base of the Rocky Mountains, and Salt Lake City, at the west base of the Wasatch Mountains, is, upon the Clarke spheroid, not less than 46″, or nearly three-fourths of a mile. This difference is, of course, easily accounted for by the topographic surroundings of the two places.

Throughout the work differences of altitude were carefully measured by the method of zenith distances, and thus a continuous series of altitudes was carried across the continent.

During these twenty-seven years there has been expended upon the triangulation the sum of $500,000, in addition to the salaries of the men engaged upon it. The cost per linear mile of triangulation in such regions as Maryland and Delaware, which consist of partially timbered, rolling country, was $103; while in California, where the stations were upon high mountains and where large figures were employed, the cost was $463. Measured by the areas included, however, the result is quite different. Thus, in Indiana and Illinois, a partially timbered and rather level region, the cost was $11 per square mile; while in Colorado, where the stations were high and lines long, the cost was only about $2 per square mile. Measured by the cost per station occupied, the results again are different. In Indiana and Illinois the cost per station was $1,725; while in Colorado it was not less than $6,131.

In conclusion, mention should be made of the fact that the reductions of the geodetic work and the publication of the book have all been effected within the short space of two years from the completion of the field work—a most notable example of rapidity of execution and publication.

BOOK NOTICES.

La Face de la Terre, by Ed. Suess, translated under the direction of E. De Margerie. Vol. II, 8vo, 878 pp.: Colin & Cie., Paris.

This work is a translation of *Das Antlitz der Erde*, by Ed. Suess, Professor of Geology in the University of Vienna. Volume I of the translation appeared in 1897. In the general preface contained in that volume M. Bertrand affirms that when the history of geology shall be written this work of Suess will be placed at that stage of the creative days when light was. This is no doubt extravagant; but we need not debate upon another passage of the preface—"A work of prodigious learning;" and we may well follow Professor B. K. Emerson—"A suggestion of Suess must be carefully considered, even if it be marvellous."* No other work so fully summarizes the physical history of the globe, and its value for reference and study depends little upon the ultimate validity of even its main theories.

The thesis of the volume before us is, that widespread risings and fallings of the sea, rather than oscillations of the land, have, throughout geological time, controlled the changes of shore-lines and have been the landmarks of terrestrial history. The first chapter deals with the history of opinion on this subject. Among the authors quoted in support of the continental oscillation or secular movement theory we find: Playfair holding to real elevation of the land in Sweden; and Von Buch saying, after his researches in Lapland, "the level of the sea cannot sink;" these being later supported by the powerful authority of Lyell, Darwin, and Dana. But our author follows a long line of observers and speculators in asserting the mutability of the sea-level. De Maillet ascribed the retreat of the sea to progressive diminution of its volume; Swedenborg noted that the sea sinks more in northern than in southern regions, and gave clear expression to the doctrine of change of form in the liquid envelope; Cuvier, and Brongniart, arguing from alternations of marine and fresh-water deposits about Paris, believed in a primal sea, which retired, made way for fresh waters, and returned, to retire yet again; Robert Chambers thought that the English sea terraces might be due to the rising and sinking of distant sea-bottoms; Belt held to a swelling of equatorial waters; and Trautschold has not ceased to affirm, in the face of prevailing

* Bull. Geol. Soc. Am., Vol. XI, p. 93. Presidential Address.

opinion, that secular movements of continents are not real. It should be added that in this chapter, as throughout the volume, the references to the literature are full, exact, and of great value.

Extended chapters are given to an account of the form of the Atlantic and the Pacific shore-lines, and these are followed by detailed study of the ancient seas—Paleozoic, Mesozoic and Tertiary—showing the history of widespread transgressions and recessions in past ages.

Among the prevailing arguments for the theory of secular oscillation, we shall notice three, and observe the author's treatment of them. Of the proofs of continental elevation none has been urged with more confidence than elevated beaches, such as appear about the British Isles, along the shores of the Scandinavian peninsula, and in many other parts of the world. Where these are truly marine they may as readily be due to a rising sea as to a sinking land. But in the author's view suitable discrimination as to origin of these so-called elevated shore-lines has not been made. He devotes an extended chapter to the shore-lines of Norway. Petersen's observations in the neighborhood of Tromsö show fragmentary lines ascending, staircase fashion, as one goes up the fiords. Sexe pronounces contrary to the hypothesis of elevation because the height and number of beaches in the same fiord, or in different ramifications of the same fiord, are not invariable. In general, on the open sea the terraces are not far from the mouths of existing streams. In many side valleys of Hardanger fiord, for example, the number of levels varies from two to five.

Terraces often lead up to a moraine, which in turn has a lake behind it. Helland has shown that this association of moraines with terraces is true of nearly fifty of the chief lakes of the country. Most of the terraces of Norway must, therefore, in the author's view, be explained as evidences of the retreat of the glacier, the exception being in case of elevated beach-lines with marine shells.

The Baltic and North Sea are considered at length. Local or temporary influences are here efficient, also. As stated, for the Baltic we have atmospheric pressure, heating by the sun, ebb and flow due to winds, and, besides such seasonal changes, oscillations of a longer period, negative movement of the sea predominating.

Even fiorded coasts are not admitted as proofs of subsidence. Referring to such off-shore submerged channels as that of the Hudson, comparison is made with similar channels in Lake Geneva and Lake Constance, due, as the author holds, on authority of Forel and others, to recent erosion by deep currents. Likewise, the submerged

channel of the Congo is explained as due to sedimentary accumulation on either side. It is hardly needful for us to comment upon the difficulties entailed by such interpretation of the "drowned" margins of many lands.

For many years the remains of the Temple of Jupiter Serapis have stood as a classical proof of oscillations within historic time, or rather within the span of the Christian era. But our author will not allow this. It is but a local phenomenon. The movements here differ from those on the Baltic. They belong to the sudden and intermittent type:

> They are changes which take place in the surface parts of a chimney clogged with ashes, and neither the fresh verdure of the hills and plains, nor the careless and light-hearted animation of the inhabitants, nor historic memories should let us forget that this "little corner of pleasant land," as Horace said, the Promontory of Misenum, lies in the abyss of a volcano which is extinct, but not wholly cooled.

While thus a strenuous attempt is made to break the force of the ordinary arguments for secular oscillations of the land, a much larger body of the work, even, is devoted to two positive considerations, which the author holds to be fatal to the generally received theory. Here we have, first, a comparison of the contours of the Atlantic and Pacific Oceans, and, second, the widespread and uniform shiftings of relative level in geological time.

The Atlantic and Pacific borders are reviewed in great detail. The Atlantic borders are compared, showing some differences and some striking correspondences. Thus, Greenland is taken as the axis of symmetry. Then, on the east, we find a chain of ancient gneiss extending from Lapland to the Hebrides, and on the west a jagged chain of gneiss from Davis Straits to the Straits of Belle Isle. On the east, likewise, is the great Baltic shield (Paleozoic), and on the west the Canadian shield. Other correspondences are the pre-Permian mountains of Ireland, Cornwall, and northwestern France, and the Appalachians. Also we find the two great Mediterraneans of the east and the west. Some elements appear in Europe for which there is no equivalent on the west. Such are the pre-Devonian Caledonian chain and the Pyrenees. Summing up (p. 331): with the exception of the Cordillera of the Antilles and of the mountainous fragment of Gibraltar, bordering the two Mediterraneans, the external border of a folded chain does not form any part of the contours of the Atlantic.

For the Pacific the facts are in strong contrast (pp. 334–5). With the exception of a fragment of the coast of Central America in Guatemala, where the turning Cordillera of the Antilles is sub-

merged, all parts of the Pacific border whose geology is known are formed by chains of mountains folded toward the ocean in such fashion that their external wrinkles serve as a limit to the continent itself, where they form a girdle of peninsulas and aligned islands.

This contrast between the two oceans as respects their continental borders is held to be inconsistent with the theory of secular oscillations, as are, further, the widespread and uniform transgressions and recessions of the sea during geological time. Such oscillations cannot explain the repeated submersions and emergings of the lands. The changes observed are far too extended and much too uniform to be able to proceed from movements of the solid crust. Thus the transgressions of the Cretaceous, observed upon the Amazon, Athabasca and the Elbe, on the borders of the Nile and in the Tarim Basin, in the valley of the Narbadá and in Borneo, on the isle of Sakhalin and upon the banks of the Sacramento—these are changes which have affected the entire surface of the planet. Similar is the evidence from Paleozoic times. The positive and negative phenomena alternate in the same epoch, and one is not able to explain this fact by the uprising of the land. During the Carboniferous and other periods the solid crust has undergone vigorous foldings; but these phenomena have nothing in common with these general changes of relative level. Here we have explained the possibility so remarkable, that we are able to use the same terminology to distinguish sedimentary terrains in all parts of the globe. The movements of the sea, to which changes of level are ascribed, are held to be oscillatory, and the principal cycles of oscillation embrace within their range minor or secondary cycles of change.

The author's theory must now be briefly outlined. Some areas of the sea-bottom sink and the water-level is drawn down; hence, though the sinking be local, the subsidence of water-level is general. The continental areas are left behind and bear the character of horsts.* Such negative movements are relatively sudden. The chief fields of sinking were toward the south, and running down between them, where they merge, we find the pointed southern extremities of Africa, India, and Greenland.

But how are the positive movements explained? Here the tireless processes of denudation and transfer of land-waste to the sea are called forward. By this means the sea-bottom is aggraded and

* A horst is a region or block of country left at a considerable altitude by the subsidence of surrounding areas.

the water-level raised, this going on ever slowly, as distinguished from the more abrupt negative movements.

Many supplemental factors are cited, but hardly with such definiteness as to meet the conclusions of varied and refined observations upon changes of level going on in recent decades and centuries. Thus the height of the sea is said to depend on many conditions—solar heat, atmospheric pressure, prevailing winds, influx of fresh water, evaporation, local attraction, and many other circumstances. The average level is hard to determine, and needs a long series of observations. This is especially the case as regards the influence of winds, and, indeed, of all the meteorological factors. The tides, being periodic, can be eliminated. Actual dislocations or oscillations are admitted as occasionally occurring, as in the uplift by Cook Strait in the New Zealand earthquake of 1856.

This review has aimed only to set forth some of the chief points of Suess' theory, which are urged with great wealth of learning and illustration. Perhaps first among the objections that will rise in the mind of every American student will be the tiltings or differential movements of large areas, such as are demonstrated by the deformed ancient beaches of the Great Lakes or by the widely variant present altitudes of the Cretaceous deposits of the Great Plains.

A. P. B.

A Reader in Physical Geography for Beginners, by Richard Elwood Dodge, Professor of Geography in the Teachers College, Columbia University, 237 pp.: Longmans, Green and Co.

This little volume deserves attention at the hands of all teachers of geography. As stated by the author in his preface, only an account of the more important principles is attempted, the aim being to set forth the conditions of human life as depending on physical features. It is designed for use in connection with a text-book. In this manner it will supply new points of view and fresh illustration of many themes. Teachers who are still obliged to use antiquated text-books will find the Reade respecially helpful as a supplement. This is the more true because the most modern views of the development of the lands are treated with simplicity and in entire avoidance of difficult or technical conceptions. The author has been successful in writing for beginners, and wholly avoids condescension in meeting his young readers.

The main topics are: The World as a Whole; The Continents; The Industries of Men; The Origin of Land-Forms; The Great

Land-Forms; Climate; and other important physical features influencing man. There is much fresh and helpful illustration; thus, in giving to weathering its due weight in denudations:

> Sometimes the river is likened to a railway train that receives and carries all freight delivered to it, and the atmosphere and gravity to the farmers who prepare the freight for shipping and take it to the train.

Equally good is this of meander curves:

> The country boy living near a stream knows the deep part of the stream as his swimming pool, the sandy or gravelly slope on the inside of the curve as his out-of-door bath-house, and the steep bank, perhaps, as a diving-board.

We may further cite the reference to the camper and canoer's language, the "rapids and reaches" of a river; the "tying and untying" of islands by the sea; the flat-iron as illustrating glacial work (p. 125); the drumlin as shaped like half a foot-ball; the alluvial fan as an open-air delta; and the volcanic plug, resembling the cork in a bottle. Every teacher knows the value of such comparisons drawn from common experience. Space will not admit of quoting here the admirable description of wave-action on the seashore (p. 101). There are 89 well-selected pictorial illustrations, mainly from photographs.

A. P. B.

Cabot Bibliography, with an Introductory Essay on the Careers of the Cabots, Based upon an Independent Examination of the Sources of Information, by George Parker Winship. London, Henry Stevens, Son & Stiles, 39 Great Russell Street, over against the South-west Corner of the British Museum. New York: Dodd, Mead & Company, MDCCCC.

This work is the extension of a small Cabot bibliography prepared for use during the celebration of the four hundredth anniversary of John Cabot's visit to North America.

The effort has been to include a description of every publication which has influenced noticeably the popular or the scholarly conceptions of John and Sebastian Cabot, or which is likely to prove useful to those who wish to study the careers of the Cabots and their contemporaries.

It does not appear that Mr. Winship has neglected any source of information in his difficult task, and students will remain under obligation to him. His annotations are interesting—one, on page 174, especially so to New Yorkers:

> TRUAX (CHARLES H.) Opinion by the court, in case of Mortimer *et al.* v. New York Elevated Railroad Company *et al.* . . . . .
>
> The court, having carefully examined BANCROFT, No. 248, BRYANT AND GAY,

No. 288, and especially Mrs. MARTHA J. LAMB's *History of New York*, expressed the legal decision that as a result of Cabot's discovery of North America in 1497 on behalf of England; the English common law, and not the Dutch Roman law which lurked in the hold of Henry Hudson's vessel when he first explored Manhattan bay, determined the relation of abutters to the use and enjoyment of the public streets. Heavy damages were therefore awarded against the Elevated Railway Company.

The Introductory Essay tells the story of the Cabots with care and impartiality. Mr. Winship writes of Sebastian in particular, *studiis odiisque carens*, and, with the exception of one passage, this is the tone of his book. He says on page xxxii:

> The Spanish historians, cognizant of their national characteristics, have been the first to suggest the probability that Sebastian Cabot, a foreigner in high position, found his work made difficult by a lack of confidence and co-operation on the part of his Spanish associates and subordinates.

Is jealousy of a foreigner in authority over themselves a characteristic of Spaniards rather than of Englishmen, or Germans, or Frenchmen? By no means; the characteristic is human, not national, and to assume the contrary smacks of self-righteousness.

Author, printer, and publisher have done their best for this beautiful book.

Bibliotheca Açoriana. Noticia Bibliographica de Escriptos nacionaes e estrangeiros concernentes ás Ilhas Dos Açores. Vol. II, por Ernesto do Canto. Typ. de Eugenio Pacheco, Ponta Delgada. 1900.

It is ten years since Senhor do Canto published the first volume of his bibliography of works relating to the Azores. In this long interval of time he has continued his researches, finding a rich vein of information in the previously unexplored files of the periodical press of the Islands. His first thought, as the materials accumulated under his hand, was to bring out a second edition of the original book; but it seemed better to print this second volume.

The work is well done, though in this, as in too many bibliographies, one sighs for a sufficient authority to draw the line. If every publication is to be registered, what is to become of mankind? Life is too short for these things. A journal that lived for eight weeks in the year 1888 might be left to its long sleep.

The *Bibliotheca* is fairly printed, but on paper too thin to be read with pleasure.

TWO CARTOGRAPHIC PRODUCTIONS.

To the Secretary American Geographical Society:

DEAR SIR:

Referring to the letter of Mr. O. B. Ireland, published in No. 2 of this year's BULLETIN of the Society, in which he complains of the inaccuracy of geographical maps published by some of the leading railroad companies of the United States, and points out the misinformation likely to be inculcated into the minds of the young students from the study of the same, may I be permitted to draw attention to two most excellent cartographic productions, from the study and use of which I have derived much profit and no end of enjoyment in the pursuit of geographical studies?

Among makers and publishers of maps in Europe none are better known than the firm of JUSTUS PERTHES, in Gotha, Germany. Some of the most famous geographers and cartographers have worked for this publishing house, and names such as Stuelpnagel, Berghaus, Petermann, Stieler, Sydow and, more recently, Habenicht, Vogel, Wagner, Lueddecke, and Langhans are too familiar to need further mention. From this house came to us the well-known *large Stieler Atlas*, and the equally good small *Perthes pocket atlases* (five in number), which are designated by Mr. Hugh Robert Mill in his recent "*International Geography*" as the MOST PERFECT POCKET ATLASES KNOWN.

The firm of Justus Perthes has recently published two large charts of the world, one of which appeared a year or two ago in an improved edition under the title "*Dr. Berghaus' Chart of the World*," revised and brought up to date by H. Habenicht and B. Domann. The *second map*, published this year, is compiled by *Dr. Paul Langhans*, the author of a very useful *Commercial Atlas of the World*.

The Berghaus Chart gives a comprehensive exhibit of the chief regular commercial routes traversed by ocean steamers and sailing vessels of all nations, also the principal overland railroad lines, the telegraph and ocean cable systems, etc. In order to be of universal service in all countries of the globe, *the map was edited in the English language*. It forms a handy and indispensable companion in the offices of merchants, railroad men, maritime offices, civil engineers' offices, but is likewise adapted for libraries, colleges, schools, as well as on board of vessels of the merchant marine and navy. The chart is drawn on Mercator's projection, owing to which fact the countries of the higher latitudes are shown on a greatly increased scale, and with a great fullness of detail.

The study of geography may be pursued either with the assistance of a terrestrial globe or by using reference maps and atlases. Large wall maps are, in many respects, superior to large atlases, because one is enabled to find everything on one map, without being compelled to turn over the pages of sometimes cumbersome books. Of maps suitable for applied or commercial geography, those based on Mercator projection are, for many reasons, the handiest. While they do not represent the areas on a uniform scale—those between 60 degrees latitude and the poles becoming very much exaggerated in size—the proportion between width and length is everywhere correctly maintained. As is well known, the areas increase in charts drawn on Mercator's projection in proportion to the square of the secant of the latitude ϕ, or as $1 : \cos.^2 \phi$; *i. e.*, degrees of latitude are increased on the map in the same proportion as the degrees of longitude diminish on the sphere. Hence the Mercator projection shows countries and oceans truthfully as to form, while the scale varies in different parts of the map. Such charts are particularly adapted for purposes of navigation,

for, owing to the fact that the meridians and parallels of latitude are drawn in straight lines, the course of a ship between two ports can be also drawn straight.

The Berghaus chart is beautifully engraved and shows the chief topographical features of the land, besides being full of information regarding the oceans. On the land the map shows the rivers, canals, cataracts, rapids, swamps, docks, coaling stations, treaty ports, altitudes in metres above sea-level. The different colonial possessions—British, German, French, Portuguese, Italian, Dutch, Danish and Spanish—are shown in different colors. On the water it shows the routes actually used by the principal steamship lines and sailing vessels, which are numbered and arranged in a list by continents and nationalities. It gives the tracks of outward and homeward-bound steamers, including the distances in nautical miles and the time required for the voyage; the summer and winter routes of sailing vessels, the warm and cold ocean currents, with their mean velocity; the limit of pack ice, the average and extreme limit of drift ice or of icebergs; the reefs, sandbanks and shoals dangerous to navigation, the occurrence of sea-weed, the date boundary line in the Pacific Ocean, the 200-metre (approx. 100 fathoms) line of sea soundings.

A smaller inset map gives a good representation of the countries and seas around the poles, drawn on Lambert's polar projection; another smaller map shows the principal telegraph and cable lines, a third one is entitled a wind chart. The lines of magnetic variation are also indicated, also the hours of high water, the surf-bound coasts, strong tidal streams, etc. The longitude is designated east and west from Greenwich, by degrees and also in time, and on the latitudes the duration of longest days in months, days and hours is given. In the Berghaus chart the American continent is placed in the centre of the map, which when mounted measures 61½ by 37 inches, but which can also be had as a folded map, 8 by 10 inches in size, the price varying from 20 to 24 marks.

The second wall map, by Langhans, which is 63 inches by 42 inches in size, mounted, is somewhat cheaper, being printed instead of engraved, the price, mounted, being 12 marks. On this chart, which is also represented on Mercator's projection, the longitude of Greenwich, or the zero line, is placed in the centre of the map, and on the left is shown the American continent and a part of the Pacific Ocean, while to the right we find Asia and Australia, and the western half of the Pacific Ocean, including Japan and the Philippine Islands. Though this map has special reference to German commerce and trade, and to the German colonies, it is equally well adapted for general geographical purposes. The Berghaus chart is, perhaps, more replete with information, but on the other hand the Langhans chart is much more clear and comprehensive, the lettering is large and more easily read at a distance, and the author seems to have studied hard to omit all unnecessary matters and to include all points of chief importance. For German mercantile firms this map is invaluable, because it gives not only the principal German steamer lines, but also all German consulates, all Custom-houses and treaty ports. In showing the principal rivers the aim was in each case to show by special marks the limits of their navigability.

It is difficult to express a preference between these two well-executed new maps, for each has its special adaptation and its advantages. Readers interested in geography would do well to examine and compare both maps before making a choice.

Very truly yours,

WM. PAUL GERHARD, C.E.,

Member American and National Geographic Societies.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, November 18, 1900.

The Universal Exhibition of 1900 is closed, and in the first days of October the series of International Congresses, which had succeeded each other without interruption from the beginning of June, came to an end.

The work of these Congresses is of undoubted importance; but to speak of it with precision and with sufficient knowledge we must wait for the publication of the detailed reports. We already possess the summary of the proceedings at one of these—the Congress of Colonial Sociology—but the discussions of this body are uninteresting from a geographical point of view, and we should not speak of them in this place but for the fact that the United States have taken rank among the colonial Powers.

Notwithstanding the close relation which binds colonization to geography, this correspondence is devoted to geography, and especially to the geographical questions which interest the savants and the public in France. It is impossible to treat these without alluding to the different geographical institutions, official or private, which exist in France. I propose to explain the nature of these institutions, their organization and their work, and to begin with the Committee on Historical and Descriptive Geography.

This takes the first place, because it is composed of the heads of all the French geographical services and of some among the masters of geographical science and instruction. It was formed in 1885, up to which time there was no geographical section recognized in the plan of the Committee on Historical and Scientific Work, organized in 1834 under the Ministry of Public Instruction. In 1883 geography was admitted into the section of the Natural Sciences; but practical experience showed the defects of this arrangement, and the Minister of Public Instruction, M. René Goblet, established a section (the fifth) devoted entirely to the geographical sciences.

Under its first president, Vice-Admiral Jurien de la Gravière, this section of Historical and Descriptive Geography found itself charged with the publication of many original documents, as well as with the continuation of the work left unfinished by the Commission on Historical Geography of Ancient France.

Before long it began to make its influence felt among geo-

graphers, and this has continued to increase in a marked degree under the presidency of M. Schefer and M. Bouquet de la Grye. This influence is due: 1st, to the sound and impartial criticism of *all* the publications of the French geographical societies, and to the counsel conveyed in the printed reports on the subject of these publications and others submitted to the examination of the Committee; 2d, to the control exercised by the works annually brought before the section of Historical and Descriptive Geography in the Congress of Learned Societies; 3d, to the list of questions drawn up every year in view of this Congress and distributed by the Ministry of Public Instruction to all the learned societies of the nation.

Thanks to the sound advice of the Section, a number of provincial societies have abandoned the practice of printing the lectures delivered before them by travellers, perhaps for the twentieth time, and have applied the larger part of their resources to the careful study of their own district, producing in this way, within the past ten years, and publishing contributions of very real worth. The list of questions prepared by each Congress has had an analogous result.

The most important of these contributions are published, with the minutes of the monthly meetings of the Section and the reports of the members, in the *Bulletin de Géographie Historique et Descriptive*, an annual octavo volume of more than 400 pages, with plates and maps.

Edited from the beginning by the Secretary, Dr. E. E. Hamy (Curator of the Trocadéro Ethnographical Museum, Professor of Anthropology in the Museum of Natural History, and member of the Institute), the fourteen volumes of the *Bulletin* contain a vast number of articles on France and the French colonies, as well as on other countries, besides studies in ethnography and papers on the history of geography and cartography.

The Section publishes also a series of quarto volumes, such as: *La Mission Scientifique dans la Haute Asie*, edited by M. Grenard from the notes of the regretted Dutreuil de Rhins, and the *Mission en Indo-Chine*, of M. Pavie; the *Asie Centrale*, of Dutreuil de Rhins, and *L'île Formose*, by the late Imboult-Huart; *Les Séricigènes Sauvages de la Chine*, by M. A. A. Fauvel, and *La Sculpture sur Pierre en Chine au temps des deux dynasties Han*, by M. Edouard Chavannes. These two series represent a great deal of labour on the part of the members of the Committee. There is hardly a meeting of the Section at which reports are not presented by Messrs. Bouquet de la Grye, Maunoir, Hamy, Aymonier, Henri

Cordier, Grandidier, Levasseur, Gabriel Marcel, Emm. de Margerie and other eminent men.

The most important geographical occurrence since the date of my last letter is the meeting at Paris (Sep. 25–Oct. 6) of the International Geodetic Association. This, the thirteenth session, was under the presidency of M. Faye. Besides the reports on geodetic operations accomplished since 1898, there was read to the Association a communication from Mr. Gill, Astronomer of the Observatory at the Cape of Good Hope, on the progress of the work for the measurement of a meridian arc of 104 degrees in Africa, between the Cape and Alexandria.

Five degrees in Rhodesia and three and a half in Natal have already been measured, and the Association expressed the wish to see the African work completed by the measurement of an American arc of the same extent. M. Oudemans even proposed the measurement of an equatorial arc from the French Congo to German East Africa; but this was held to be premature. After an investigation of the causes of the divergence in the results obtained in 1888, and again in 1892, by the English and the French observers for the difference of longitude existing between Paris and Greenwich, the Association learned with satisfaction that the operation would be begun anew in 1901. Great interest was displayed in a communication made by Gen. Bassot on the measurement of the arc in Peru, undertaken by the Geographical Service of the army. Between 1736 and 1743 the Academicians Bouguer, Godin, and La Condamine measured an arc of three degrees at Quito. The preliminary operations accomplished by Capts. Maurain and Lacombe permit us to think that an arc of six degrees may be measured in the territory of Ecuador. This work, which will require four years of steady application, will be under the control of the Academy of Sciences.

Questions of oceanography are attracting attention, and a Society has been founded at Bordeaux for the study of the oceanography of the Bay of Biscay. It has already completed two series of soundings at the entrance of the channels of the Gironde and in the outer basin of Arcachon, and it proposes to follow a systematic plan of dropping floats in the Bay. This Société d'Océanographie du Golfe de Gascogne is the organization of Messrs. Charles Bénard and Camena d'Almeida.

There are numerous explorations in Africa, such as Lieut. R. de Segonzac's reconnaissance in southwestern Morocco, fertile in results; the march to the Adrar, under the lead of the unfortunate

Paul Blanchet; and in the French Congo, Capt. E. Jobit's reconnaissance of the lower Likuala and Dr. A. Cureau's three years' travels on the upper Ubanghi. Both of these explorers have published their accounts in *La Géographie*.

The Geographical Service of the Army has lately issued a good account of the Chinese province of Chihli, based upon the reconnaissances of Lieut.-Col. d'Amade, and M. A. Leclère has sent very important communications on the provinces of the Empire bordering on Tonkin.

In America M. A. Cerceau, who has been engaged since 1891 in exploring the wide territory of Bolivia, has discovered regions hitherto unvisited in the Chaco and eastern Bolivia. He reports the existence of rock salt, galena, gold, sulphuret of mercury, tin, graphite, kaolin and platina, which the Indians disdain as a kind of *iron heavier than gold*.

M. de Gerlache, commander of the *Belgica* Antarctic expedition, will start early in December for the Kerguelen Islands, to make an attempt at colonisation. His steam yacht will be accompanied by a sailing vessel, and scientific observations will be made during the stay at the Islands.

Of the recent publications on the French colonies the monographs on Algeria claim the first place, and one of these, the *Historique de la Pénétration Saharienne*, by M. Augustin Bernard and Capt. N. Lacroix, gives in less than 200 pages a clear comprehension of the different phases through which the exploration of the Sahara has passed since 1830; and the authors, in closing, trace the programme of the future expansion of France in that vast region. Another remarkable book is that of M. Edmond Doutté on *L'Islám Algérien en 1900*. The author studies the Mohammedan religion as it exists throughout Maghreb, and especially in Algeria. He shows that the marabouts form the chief element and constitute the strength of the religious fraternities in the country. These latter are without cohesion and hardly wear the aspect of disciplined secret societies, and they obey with reluctance the impulses coming from the East. Several among them have rendered eminent service to the French, as set forth in the seventh chapter of M. Doutté's work.

Among monographs on the other French colonies particular mention must be made of the three volumes on Senegal, in which the resources of the colony are treated with thoroughness; the agriculture by M. Perruchot, the botany by M. Chevalier, and the ethnography by Dr. Lasnet. It must be said, however, that the physical geography has not been touched.

The same omission is to be noted in the handsome volume on *Le Tonkin en 1900*, by M. Robert Dubois.

Historical geography and archæology are not without representation. *L'Algérie par ses Monuments* is principally interesting for its illustrations, but a more serious value attaches to *L'Algérie dans l'Antiquité* by M. Gsell; and not less interesting is M. Al. Gayet's thin book on *L'Itinéraire des Expéditions de Jean de Brienne et de Saint-Louis en Egypte*—an excellent commentary on the photographs and sketches exhibited in the pavilion of the Catholic Missions at the Exposition.

Something may be said of a question much debated during the year. As long ago as 1827 the reality of Chateaubriand's travels in America was called in question, and recently, in two articles printed in the *Revue d'Histoire Littéraire de la France*, M. Joseph Bédier has taken up the subject. He affirms that Chateaubriand made use of the books of previous travellers, and that it was materially impossible for him, during his short sojourn in America, to accomplish the journeys described. The Abbé Bertrin replies in the *Correspondant*, maintaining the genuineness of Chateaubriand's journey. I think as he does; but the matter will remain in doubt, unless a happy chance should bring to light the manuscript authentic text, not improbably in America.

HENRI FROIDEVAUX.

NOTES AND NEWS.

THE ANNUAL MEETING of the Society will be held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, January 22d, 1901, at 8.30 o'clock, P.M. The order of Proceedings will be:

Election of Fellows.
Reports of Council and Treasurer.
Report of Committee on Nominations.
Election of Officers.

A. F. Schauffler, D.D., will read a lecture on Constantinople, with illustrations.

At the regular meeting, on the 20th of February, Mr. George F. Becker, of the U. S. Geological Survey, will read a paper on the Philippine Islands.

SURVEYS MADE by the ship *Nero*, for two years past, under orders of the Navy Department, for the purpose of laying a telegraph cable between the United States and the Philippine Islands, have added to the knowledge of the abyss in the Pacific on the route between the Midway Islands and the island of Guam. This abyss was previously known to be rather more than 1,900 fathoms in depth, but on the westward voyage of the *Nero* 4,913 fathoms of line were run out in an attempt to sound without reaching bottom.

In further explorations of this Nero Deep, as it is now called, Commander Hodges found bottom at 5,160 fathoms and 5,269 fathoms.

MR. G. MELVILLE BOYNTON, of Coaldale, Pleasant Valley, Hayden Creek Mining District, Colorado, sends the official map of his projected route to the North Pole by the air-ship *Columbia*.

This ship will be constructed at Coaldale, and the expedition will start on or about July 15, 1903, from Cape McClintock, Parry Islands, for the North Pole, and thence to North Cape, Spitzbergen.

IT IS ANNOUNCED that Captain J E. Bernier, of Quebec, has the support of the Royal Geographical Society for a North Pole expedition. He hopes to be aided by the British Government.

Captain Bernier will travel by the route taken by the wreck of the Jeannette. He says:

In the Polar Circle, from off the shores of Siberia, the most frequent winds are from the east and southeast, thus carrying the ice to the north and northwest and

drawing it against the shores of Franz Josef's Land, Spitzbergen and Greenland. In the Polar Circle, on the North American coast, on the contrary, the wind blows from the west and northwest, pushing the ice to the east and southeast, on the shores of North Greenland and Grinnell Land, where it accumulates from year to year and forms those eternal masses, or "hummocks," which Markham, who explored this part of the Polar Circle, says tower many feet above the moving ice. If we draw a line from Behring Strait to North Greenland we divide the Polar basin into two parts. The western part is formed of an immense block of ice bearing upon the shore of North America, which forms an impassable barrier to the pole. The eastern portion is formed by ice which has drifted from the coast of Siberia and Behring Strait, and pursues the course of the wind. When it approaches the pole it increases in thickness and volume, forming the "hummocks," which Dr. Nansen found to be about thirty feet high. These are no doubt higher nearer the pole.

Captain Bernier believes that the polar basin is a frozen ocean, over which his dogs and reindeer may make their way on ice, for the most part, free of impediment. He purposes to enter on the Siberian side, near the Lena, or Bennett Island, and proceed at the rate of four miles a day. He will take 120 reindeer and a rubber raft capable of carrying 18,000 pounds, thirty sledges made of aluminum and wood, and food enough to last two and a half years, though he believes he will return in eighteen months. The members of the expedition are to be the commander, one geological surveyor, six selected men, and one man to take charge of the dogs and reindeer. The captain's reputation as a navigator is very high; Nansen thinks he may succeed, and so does Dr. Dawson.

A CORRESPONDENT in Lima sends the following note, furnished by the writer:

In their reply to the pupils of the Italian schools, the inmates of the Lima Orphan Asylum express themselves in these words: "We have received the news of a terrible disaster at Galveston. Such is life; one moment we enjoy pleasure and another we suffer grief. Send to this distressed population the golden urn which, with Christian intention, was donated to us. We send it with the permission of the Director of the Benevolent Institute as a contribution to the funds for the aid of the sufferers by the Galveston disaster. We have nothing else at our disposal."

The golden urn referred to was discovered June 14, 1899, in a burying-ground of the old Peruvians in the Monjas section of an estate called Monte Rico Grande, about four miles from Lima. The urn weighs 224 grammes. It is not made of gold, but of a compound similar to the *electrum* of the ancients. It has on two sides human heads, with the large nose of the prehistoric Peruvian race.

G. R. GEPP.

Oct. 31, 1900.

A LETTER to the *Evening Post* under date of December 1, written from Cocoa, Florida, gives some account of the Seminole Indians in the Everglades.

According to the census of 1900, these Indians number 339. The letter says:

That the tribes are doomed to speedy dissolution may be readily believed when one realizes that where two years ago hundreds of acres were cultivated in corn, peas, rice, pumpkins and potatoes, there are now, by actual observation, but two acres. The young bucks devote their time to trapping and hunting, and at the near-by stores of the whites exchange hides and fresh game for the necessities formerly produced by them on their own ground. . . .

The Indians of Florida have persistently refused to occupy any certain locality that has ever been selected for them by either the United States or the State Government. . . . These 339 Indians are divided into five tribes or "families," all under one "big chief," who has in each tribe a representative or sub-chief. These "families" are scattered over the State in several localities, and from this fact probably arose the confusion as to their numbers. They are generally friendly with the whites. The younger men answer questions promptly in fair English; the older ones speak little or no English. Men predominate among them, forming almost two-thirds of the entire number. Among them are many modern conveniences of civilized life—sewing machines, cooking stoves, mirrors; and plenty of table furnishings—plates, cups and saucers, and knives and forks. The men wear a queue, coiled on top of the head under the turban, after the manner of the Chinese; the woman "bangs" her hair across the front and coils the rest on the top of her head also. Around her neck she wears as many strings of beads as she can carry, and strung across her breast are hammered silver coins representing the wealth of her father or her husband. The children are generally naked until about twelve years old, when the girls don a dress and the boys a breech-cloth. All are barefoot except the men, who generally wear deerskin moccasins.

M. Henryk Arctowski, a member of the *Belgica* expedition, sketches, in the review *Ciel et Terre*, of November 1, a plan for international co-operation with the Antarctic expeditions of 1901.

These are the English and the German, and the Argentine expedition to the South Shetlands, with observers stationed on Staten Island. There is yet time, he says, to make the year 1902 a year of international observations in the Southern Hemisphere by establishing a polygon of meteorological stations, comprising the following points:

Punta-Arenas, Staten Island, Cape Pillar, and one of the Diego Ramirez islands, southwest of Cape Horn; the Falkland Islands, South Georgia and South Shetland, and one or two points on the lands discovered by the *Belgica*.

Such a network of observations would furnish a thorough knowledge of the meteorology of all that part of the Antarctic and form a most important contribution to the study of the atmospherical circulation.

Mr. Edwin Swift Balch, of Philadelphia, sends this note:

Icebergs in Glacier Bay.—On the 14th of July, 1900, I visited Glacier Bay, Alaska, on the steamer *Queen*. At a distance of about twenty kilometres from Muir Glacier we found a line of icebergs, some twenty to thirty metres wide, extending

completely across the bay. The steamer went through this barrier very slowly, gradually pushing the bergs aside. Beyond this the bay was studded with icebergs, among which the *Queen* took a more or less zigzag course up to within about seven kilometres from the snout of Muir Glacier, where a barrier of icebergs stretched from shore to shore across the bay and extended all the way up to the glacier. These bergs were not floe-ice at all, but genuine glacier bergs. Many of them were good-sized ones, rising certainly six or eight metres above the water. On some of them there were boulders, on many there was moraine dirt, on others there was snow, and in some the glacier crevasses remained, showing the blue and green colors of such crevasses. In some cases the bergs had evidently turned over in the water. A noticeable feature was a projecting shelf of ice at the surface of the water, showing that the ice had melted away fastest underneath. The icebergs are said to be due to an earthquake, in the fall of 1899, fracturing a portion of the snout of Muir Glacier; but, as far as could be seen through marine glasses, the glacier was unaffected by the loss of all this ice. The scene was Arctic in character and, with the peaks of Fairweather and Crillon occasionally peeping out through the clouds at a height of over 4,500 metres, was a grand sight. It may be worth noting that the Crillon-Fairweather range is unexplored, and that it offers to climbers the finest array of unascended summits in America.

THE ROYAL GEOGRAPHICAL SOCIETY OF AUSTRALASIA, QUEENSLAND, will award the Thompson Foundation Medal (in gold) to the author of the best original paper (to be sent in not later than the 15th of June, 1902), on The Pastoral Industry of Australia, past, present, and probable future.

The competition is open to Members and Non-Members of the Society alike, whether residing in Australasia or elsewhere. No award will be made for a compilation.

All competitive communications for the Medal should be written on one side of the paper only, with marginal space on the left-hand side thereof. Instead of the writer's name each paper must be identified by a motto. A sealed envelope with such motto written outside, and the writer's name and address inside, should accompany each paper.

The successful papers will be published in the Journal of the Society, fifty reprint copies of each being supplied to the author, free.

All communications must be written in the English language, and will become the property of the Society.

Papers may be illustrated by maps, diagrams and pictures.

All communications should be addressed to the Hon. Secretary of the Society.

HUGH M. NELSON, President.
J. P. THOMPSON, Hon. Secretary.

THE SOCIETY'S ROOMS, 102 Elizabeth Street,
Brisbane, Queensland, October 2nd, 1900.

THE SOCIÉTÉ KHÉDIVIALE DE GÉOGRAPHIE celebrated, on the 11th of December, the twenty-fifth anniversary of its foundation. The Société has had a remarkable career, and it deserves the congratulations of all who are interested in geography.

ACCESSIONS TO THE LIBRARY.

NOVEMBER–DECEMBER, 1900.

BY PURCHASE.

Geographisches Jahrbuch, Band XXIII, 1te Hälfte, Gotha, 1900, 8vo; Cabot Bibliography, with Introductory Essay, etc., by George Parker Winship, London, 1900, 8vo; North End and West Side of City of New York: Official Maps of the Commissioners of Central Park, New York, 1868, 2 sheets in case; Prince Henry the Navigator, by C. Raymond Beazley, New York, 1895, 8vo; From the Levant, the Black Sea and the Danube, by R. Arthur Arnold, 2 vols., London, 1868, 8vo; Early History of Southampton, Long Island, N. Y., by G. R. Howell, New York, 1866, 8vo; Historic Chateaux, by A. B. Cochrane, London, 1877, 8vo; In the Volcanic Eifel, by K. S. and G. S. Macquoid, New York, 1896, 8vo; A History of British India, by Sir W. W. Hunter, *Vol. 2*, London, 1900, 8vo; Australasia (British Empire Series, Vol. IV), London, 1900, 8vo; The Problem of Asia, by A. T. Mahan, Boston, 1900, 8vo; In and Around the Grand Canyon, by G. W. James, Boston, 1900, 8vo; Memoirs of a Revolutionist, by P. Kropotkin, Boston, 1899, 8vo; A Book for All Readers, by A. R. Spofford, New York, 1900, 8vo; The Jews of Angevin England, by Joseph Jacobs, New York, 1893, sq. 16mo; China's Only Hope, by Chang Chih-Tung, New York (1900), 12mo; The Great Salt Lake Trail, by H. Inman and W. F. Cody, New York, 1898, 8vo; La France Hors de France, par J.-B. Piolet, S. J., Paris, 1900, 8vo; On the Trail of a Spanish Pioneer, the Diary, etc., of Francisco Garcés, by Elliot Coues, New York, 1900, 2 vols., 8vo; De Paris aux Mines d'Or de l'Australie Occidentale, par O. Chemin, Paris, 1900, 8vo; Tuscan Studies and Sketches, by Leader Scott, New York, 1887, 8vo; Personal Narrative of Two Years' Imprisonment in Burmah, by Henry Gouger, London, 1860, 8vo; Pen and Pencil in Asia Minor, by William Cochran, New York, 1888, 8vo; The Voyage of Captain John Saris to Japan, 1613, edited by Sir E. M. Satow, London, 1900, 8vo; Thalassa, an Essay on the Depth, etc., of the Ocean, by John James Wild, London, 1877, 8vo; Chinese Plan of the City of Peking, T. B. Jervis, Publisher, London, 1843, sheet 35 x 45 in.; Carte de la Chine, Physique et Politique, par Bianconi, Paris (1900), sheet; A Journey in the Back Country, by Frederick Law Olmsted, New York, 1860, 12mo; Flora of the Southern United States, by A. W. Chapman, New York, 1872, 12mo; Early New York Houses, by William S. Pelletreau, New York, 1900, 8vo; The Story of My Life, by Sir R. Temple, London, 1896, 2 vols., 8vo; History of South America, translated from the Spanish by Adnah D. Jones, London, 1899, 8vo; Industrial Cuba, by Robert P. Porter, New York, 1899, 8vo; A Tour in Greece, by Richard R. Farrer, Edinburgh, 1882, 8vo; Exploration of the Valley of the Amazon, by W. L. Herndon and Lardner Gibbon, 2 vols., Washington, 1853–54, 8vo, with 2 cases of maps; Behar Proverbs, Classified and Arranged, by John Christian, London, 1891, 8vo; Description of the City of Canton (2nd Edition), Canton, 1839, 12mo; Geography of Pennsylvania, by Charles B. Trego, Philadelphia, 1843, 12mo; A Nile Journal, by T. G. Appleton, London, 1876, 8vo; Gazetteer of the State of New York, Albany, 1842, 8vo; Life and Times

of David Zeisberger, by Edmund de Schweinitz, Philadelphia. 1870, 8vo; Description of the Canals and Railroads of the United States, etc., by H. S. Tanner, New York, 1840, 8vo; Historical and Descriptive Sketches of Norfolk and Vicinity, by William S. Forrest, Philadelphia, 1853, 8vo; A Report on the Trees and Shrubs growing in the Forests of Massachusetts (by Geo. B. Emerson), Boston, 1850, 8vo; Minerva: Jahrbuch der Gelehrten Welt, 1900–1901, Strassburg, 1901, 8vo; The World's Discoverers, by William Henry Johnson, Boston, 1900, 8vo; The History of Colonization, by Henry C. Morris, New York, 1900, 2 vols., 8vo; An American Engineer in China, by W. B. Parsons, New York, 1900, 8vo; America's Working People, by Charles B. Spahr, New York, 1900, 8vo; The Siege in Peking; by W. A. P. Martin, New York, 1900, 8vo; Sport and Travel East and West, by F. C Selous, New York, 1900, 8vo; The Far East, by Alexis Krausse, New York, 1900, 8vo; New Pronouncing Dictionary of the Spanish and English Languages, M. Velásquez de la Cadena, Revised, etc., by Edward Gray and Juan L. Iribas, 1st Part, New York, 1900, 8vo; Through Armenia on Horseback, by George H. Hepworth, New York 1898, 8vo; The Life of the Buddha, etc., translated by W. W. Rockhill, London, 1884, 8vo; Spain and Morocco, by Henry T. Finck, New York, 1891, 8vo; A Corner of Spain, by Miriam Coles Harris, Boston and New York, 1898, 16mo; Almanach de Gotha, 1901, Gotha, 1901, 8vo; Appleton's Cyclopædia of American Biography, edited by J. G. Wilson, *Vol. VII*, New York, 1900, 8vo; Historic New York, being the Second Series of the Half Moon Papers, edited by M. W. Goodwin, and others, New York, 1899, 2 vols., 8vo; Noticias Historicas, etc., de la Isla de Pinos, por Ramon de Piña y Piñuela, y otros, Habana, 1850, 8vo; Diccionario topographico, etc., da Comarca do Alto-Amazonas, por Lourenço da Silva Araujo e Amazonas, Recife, 1852, 16mo; Memorias Geograficas, etc., de la Isla de Puerto-Rico, Puerto Rico, 1831–33, 6 Tomos, 4to; Istoria della Sacrosanta Patriarcale Basilica Vaticana, Filippo Maria Mignanti (2 vols. in 1), Roma, 1867, 8vo; Bosnie et Herzégovine, par Charles Yriarte, Paris, 1876, 16mo; Four Years Among Spanish-Americans, by F. Hassaurek, London, 1868, 8vo; Voyage en Patagonie, par Henri de la Vaulx, Paris, 1901, 16mo; American Book-Prices Current, New York, 1900, 8vo.

BY GIFT.

From Ernesto do Canto, Author:

Bibliotheca Açoriana, *Vol. 2*, Ponta Delgada, 1900, 8°.

From Richard E. Dodge, Author:

A Reader in Physical Geography for Beginners, New York, 1900, sq. 16°.

From Pedro Torres Lanzas, Jefe del Archivo, Author:

Relación Descriptiva de los Mapas, Planos, etc., de México y Floridas existentes en el Archivo General de Indias. Sevilla, 1900, 2 tomos, 16°.

From Jules Leclercq, Author:

Un Séjour dans l'Ile de Ceylan, Paris, 1900, 18°.

From the Minister of Public Instruction, Christiania, Norway:

Norway: Official Publication for the Paris Exhibition, 1900; Kristiania, 1900, 8°.

From Chandler Robbins:

The Journal of Two Voyages along the Coast of China, 1831–32, etc., by Charles Gutzlaff, New York, 1833, 12°; A Sketch of the Kafir and Zulu Wars, by Henry Hallam Parr, London, 1880, 8°; A Forbidden Land, Voyages to the Corea by Ernest Oppert, New York, 1880, 8°; A Voyage to the China Sea, by John White, Boston,

1823, 8°; The Head-Hunters of Borneo, by Carl Bock, London, 1881, 8°; Eleventh Annual Report of the Commissioners of the Central Park, 1867, New York, 1868, 8°.

From Prof. Israel C. Russell, Author:

A Preliminary Paper on the Geology of the Cascade Mountains in Northern Washington. *Extract from the 20th Annual Report, U. S. Geological Survey, 1898–99 Part 2.*

From Geo. F. Seward:

Report of the Committee on State and Municipal Taxation of the Chamber of Commerce of the State of New York, New York, 1900, p., 8°.

From Charles M. Taylor, Jr., Author:

Odd Bits of Travel with Brush and Camera, Philadelphia (1900), 8°.

TRANSACTIONS OF THE SOCIETY.

A regular meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, November 13, 1900, at 8.30 o'clock, P.M.

Vice-President Moore in the chair.

The following persons, recommended by the Council, were elected Fellows:

George Melville Boynton.
Charles Vetter, Jr.
Bertrand F. Bell.
Edwin S. Balch.
Ed. F. Burke.
Emil S. Fischer.
John R. Weeks.

The Chairman introduced the speaker of the evening, Mr. Edward Whymper, who delivered a lecture entitled "Twenty Thousand Feet above the Sea." This was illustrated with stereopticon views.

On motion, the Society adjourned.

A regular meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, December 11, 1900, at 8.30 o'clock, P.M.

Vice-President Moore in the chair.

The following persons, recommended by the Council, were elected Fellows:

Gen. Russell Hastings.
Henry Freeman Walker, M.D.
Gardner Wetherbee.
Orrin S. Wood.
Francis H. Leggett.
Howard K. Burras.
Justus L. Bulkley.
Edmund Carleton.
William Ziegler.
Wm. T. Wardwell.
Charles Wehrhane.
F. Gray Blinn, M.D.
Grenville L. Winthrop.
George S. Bowdoin.
John T. Willets.

The Chairman then introduced W. A. P. Martin, D.D., President of the Imperial University, Peking, who addressed the Society on the Siege in Peking; its Causes and Consequences.

A vote of thanks to Dr. Martin was proposed and unanimously adopted.

On motion, the Society adjourned.

INDEX TO VOL. XXXII.